2015

Disparities Between Men and Women in the Time of Initial EKG Acquisition

Beverly McGillivray
Rhode Island College

DISPARITIES BETWEEN MEN AND WOMEN IN THE TIME OF INTIAL EKG ACQUISITION

by

Beverly McGillivray

A Major Paper Submitted in Partial Fulfillment

of the Requirements for the Degree of

Master of Science in Nursing

in

The School of Nursing

Rhode Island College

2015

Abstract

Cardiovascular disease is the most common cause of death around the world. Initial treatment is often time dependent. An EKG is the single most important initial clinical test to diagnose acute myocardial infarctions. Recognizing acute coronary symptoms in the initial presentation to an emergency department is critical in order to obtain the initial EKG. Of concern is the likelihood of delay in the initial EKG acquisition for females. The purpose of the research study was to distinguish if there is a disparity between genders to the best practice of door to EKG in 10 minutes from the arrival time in the Emergency department. A retrospective chart review was conducted with a total of 60 charts consisting of 30 females and 30 males who experienced an AMI. The time of initial arrival to the ED and initial EKG acquisition were compared. Results demonstrated that the initial EKG acquisition was shorter for males, average of 15 minutes as compared to females, average of 18 minutes. The data also demonstrated that only 32% (n=19) of patients had an initial EKG in 10 minutes or less and 68% (n=41) in greater than 10 minutes. Average age of females was 72 compared to males at 62. Thirty seven percent (n=22) of the patients presented with a chief complaint other than chest pain. Further research is indicated to determine reasons for delay in initial EKG acquisition between genders.

Table of Contents

DISPARITIES BETWEEN MEN AND WOMEN IN THE TIME OF INTIAL EKG ACQUISITION

Background and Statement of the Problem

Cardiovascular disease (CVD) is the leading cause of death around the world and is believed to affect mainly men but in reality just as many women die from CVD as men. CVD is a range of conditions that affect the heart, including hypertension (HTN), coronary artery disease (CAD), heart failure (HF), stroke, and heart defects from birth also known as congenital heart disease. Conditions that involve narrowed or blocked blood vessels that can lead to heart attacks, chest pain and stroke are generally referred to as CVD (Mayo Clinic, 2014).

CVD is the number one killer of women. In 2009, 292,188 women died from CVD accounting for 1 in every 4 female deaths. Almost 64% (2/3) of women who die from CVD had no previous symptoms (Centers for Disease Control [CDC], 2013a). Many women don't realize how great a threat heart disease really is and tend to think breast cancer is their biggest health risk. Until a woman experiences signs and symptoms of a heart attack, CVD can be silent and consequently not diagnosed. Women tend to ignore signs and symptoms of a heart attack and attribute what they are feeling to other things such as heart burn or menopause but not to heart disease itself. Women may experience chest pain as a symptom of heart attack just like men but they can also have many other signs and symptoms such as pain in the neck/jaw/throat, upper abdomen or back, nausea and fatigue. The symptoms can be attributed to something other than heart

disease by women and even health care providers. Symptoms need to be recognized as heart disease sooner in order to get timely treatment.

Time is muscle death and every second counts. When a patient presents to an emergency department (ED) the health care providers need to recognize the signs and symptoms and quickly obtain an electrocardiogram (EKG). The American Heart Association (AHA) and American College of Cardiology (ACC) recommend time of arrival to an ED and time to an EKG to be within 10 minutes (American Heart Association [AHA], 2013). Research shows that women have a longer wait from door to EKG. Females with delayed diagnosis or recognition of heart disease have an increase in detrimental outcomes, a higher rate of mortality and increased lengths of stay in the hospital adding increase burden and cost (Glickman et al., 2012).

CVD is a common condition among males and females. There is a need to recognize differences in patient presentation of symptoms for CVD among gender. The purpose of the project was to distinguish if a disparity between genders in best practice of "door to EKG in 10 minutes" exist in the ED.

Review of the Literature

A search of Ovid, CINAHL, MEDLINE and PubMed databases was performed using search terms “cardiovascular disease” and “EKGs”, “females and cardiovascular disease with best practice of EKGs” “disparities between gender for EKGs: for the years 2005-2014. An overview of CVD will be presented including pathophysiology, risk factors, myocardial infarction, EKGs, seeking care, symptom presentation, and disparity in treatment.

Cardiovascular Disease

CVD includes a number of conditions that affect the structures or functions of the heart. Many of these conditions arise due to a buildup of plaque in the walls of the arteries by a process called atherosclerosis (AHA, 2014). The blood in the arteries carry vital oxygen and nutrients. The plaque builds up in the arteries making them more narrow, which in turn makes the blood more difficult to get through thus at times causing a blood clot. When a blood clot forms, it blocks off blood flow to the part of the heart muscle that the artery supplies. This is called a myocardial infarction (MI), also known as a heart attack.

CVD is the leading cause of death around the world. In 2008 it was estimated that 17.3 million people died from CVD, representing 30% of all deaths around the world. The World Health Organization (WHO) reports that this number will increase to 23.3 million by 2030 and that CVD will remain the single leading cause of death (WHO, 2013).

Risk of Cardiovascular Disease

Many women do not seem to realize how great a threat CVD is and do not recognize the risk factors for CVD. The risk factors include unhealthy diets, physical inactivity, tobacco use and harmful alcohol use. High lipid levels, HTN, obesity and elevated glucose levels are signals to the primary care clinician of potential unhealthy habits. It is important that a person work hard to modify unhealthy habits as they account for approximately 80 % of coronary heart disease and cerebrovascular disease (WHO, 2013). The CDC reports that the three main risk factors are HTN, high low density lipoprotein (LDL) cholesterol, and smoking. About half of American adults (49%) aged twenty years or older have at least one of these risk factors (CDC, 2013b). The overall cost of CVD is estimated to be at $444 billion dollars (CDC, 2011).

CVD can be managed by lifestyle modifications. Management begins with education. Supplying patients with information on how to prevent CVD could have prevented at least 200,000 deaths. (CDC, 2013b). Education on smoking cessation, diet changes, increasing physical activity, and managing HTN, high cholesterol and diabetes needs to be started early. More than half of these preventable deaths occur in people 65 years and younger (CDC, 2013b). There are many programs that can help with prevention efforts. The Affordable Care Act is making it easier for people to have regular health care thus making it easier to speak with their primary medical doctor (PMD) about the ABC's of heath care. The ABC's of health care consist of Aspirin therapy for those who need it, blood pressure control, cholesterol management and smoking cessation (CDC, 2011).

Myocardial Infarction

Acute coronary syndrome (ACS) is a group of conditions and related symptoms that include MI, angina and chest pain. Patients with ACS benefit from an early EKG (Docherty, 2003; Wagner et al., 2009). Individuals are at risk for a MI if CVD is not controlled. A MI occurs when a portion of the heart is deprived of oxygen because of blockage of one of the coronary arteries which supply the heart muscle (myocardium) with blood. Lack of oxygen causes characteristic pain and death to the myocardium. The blockage is due to plaque buildup on the arterial walls which causes clotting (John Hopkins Medical, 2013). The three major classifications of MIs are coronary artery spasms, ST-segment elevation MI (STEMI) and non-ST elevation MI (NSTEMI). Coronary spasm occur when the artery wall tightens and blood flow is restricted causing demand ischemia, a condition in which the heart requires more oxygen than can be supplied.

A STEMI is when a coronary artery is completely blocked and a large part of the heart muscle is unable to receive blood causing death of the heart muscle. A STEMI is an immediate emergency that requires either thrombolytics or angioplasty. Thrombolytics are medications that can break up the clot and are administered through an intravenous (IV) line. Thrombolytic medications, such as Reteplase, Streptokinase and Alteplase dissolve dangerous clots in the blood vessels improving blood flow and preventing damage to tissues and organs such as the heart. The other emergent intervention is angioplasty in which a guide wire is inserted usually through the femoral artery up to the coronary arteries, images are taken to see where the blockage is, then the clot is either

drawn out or a small balloon is inflated to push the blockage out of the way. A stent is then placed to permanently prop open the artery to allow blood flow through to the heart muscle (The Society for Cardiovascular Angiography and Interventions [SCAI], 2015).

A NSTEMI is when there is no change in the ST segment part of the EKG, usually has less damage to the myocardium, and shows up in a blood test called Troponin (SCAI, 2015). Troponin is a protein that is released in the blood from damaged heart muscle. Treatments for a NSTEMI include medications that protect the heart and reduce workload, including beta blockers, nitroglycerin (NTG), angiotensin converting enzyme (ACE) inhibitors and anticlotting medications. The patient will also undergo a full history and physical exam to determine the need for further testing including echocardiogram, nuclear study or exercise stress test. Additional cardiac tests may detect presence of blockages for which the patient may require an angioplasty (SCAI, 2015).

Electrocardiogram

An EKG is a non-invasive test used to record the electrical activity of the heart. The heart produces tiny electrical impulses which spread through the heart muscle to make the heart contract and pump blood. The heart's electrical impulses are translated and recorded as line tracings on paper. There are normal patterns detected by each electrode that is placed on the body (National Institute of Health [NIH] 2012). The EKG has become the most common cardiovascular diagnostic procedure and a fundamental tool of clinical practice (Kligfield et al., 2007). The EKG is used in the ED as a critical diagnostic tool for diagnosis of acute myocardial ischemia and infarction. The standard EKG is capable of providing information as to which vessel is blocked. Indications of

acute ischemia and MI include peaking of T waves, ST-segment elevation as well as depression, changes in the QRS complex, and inverted T waves (Wagner et al., 2009). When the ST segment is elevated it is called a STEMI and requires thrombolytics or angioplasty. No elevation in the ST segment or elevation in less than two contiguous leads, ST segment depression, T-wave inversion, or no abnormalities can indicate a NSTEMI (Wagner et al., 2009). Further cardiac testing may be required.

Delay in Seeking Care

In 2008 it was estimated that 310,000 people died from a cardiac event before getting to an ED (Turris, 2008). Women delay seeking care for various reasons. Some do not recognize the symptoms as cardiac related, others put their family first and have a need to take care of the family instead of themselves, and some have reported their symptoms to their physicians and the physicians didn't recognize the symptoms as cardiac related (Turris, 2008; Underwood, 2006).

Jensen & Moser (2008) conducted a literature review to synthesize and critically analyze gender differences in knowledge, attitudes, and beliefs about heart disease. The researchers used studies that were conducted with just females and studies that included both genders. The studies revealed that both men and women have lack of knowledge of symptom presentation and risk factors for heart disease. Men and women both recognized that chest pain was the most common symptom but had little knowledge of other ACS symptoms and when faced with the symptoms were not sure what to do and often delayed seeking treatment. Both men and women had poor recall of risk factors for heart disease. Women were able to pick the risk factors out of a list. Women believe they are not at risk

for heart disease, that heart disease is a man's disease and breast cancer is their number one risk. Ninety percent of the individuals said they would call 911 in the event of a MI. This contradicts the fact that most people delay seeking care. Most women wanted to be sure they were having a MI before going to the ED and most of them drove themselves instead of calling 911.

Nguyen, Saczynski, Gore, & Goldberg (2010) conducted a systematic review of the literature from 1960 to 2008, for a total of 42 articles used in the analysis. The review provides an overview of the published literature that has examined age and sex difference and the extent of prehospital delay in patients hospitalized with AMI. The researchers revealed that the majority of studies showed that women and the elderly were more likely to have a delay in seeking care than men and younger people. The median duration of prehospital delay for women ranged from 1.8 hours to 7.2 hours and for men the range was 1.4 hours to 3.5 hours. A total of 24 studies found that women were more likely to have longer delays than men. Some factors associated with prehospital delay were sociodemographics, medical history and clinical presentation.

Symptom Presentation

"Rapid, accurate diagnosis is necessary to implement timely lifesaving treatment" (Chen, Woods, & Puntillo, 2005, p. 240). Patients and health care providers need to recognize symptoms other than chest pain as significant for AMI. The "Hollywood" presentation of AMI is a person clutching his chest and then falling to the ground. This is not the typical presentation for patients with AMI, especially for women. Atypical symptom presentation is more likely to cause delay in treatment due to patients not

thinking of their symptoms as cardiac related and not seeking help in a timely fashion. The other reason is that health care personnel may not recognize these symptoms as AMI related. Most campaigns for heart disease promote chest pain as the cardinal symptom of AMI.

Lichtman et al., (2015) conducted a qualitative study of women aged 55 or less in order to capture individual perspectives and experiences of women diagnosed with AMI. Theoretical saturation was achieved upon completion of 30 interviews. There were five theme characteristics:

1. Prodromal symptoms varied substantially in both nature and time
2. Participants inaccurately assessed personal risk of heart disease and commonly attributed symptoms to non-cardiac causes
3. Competing and conflicting priorities influenced decisions about seeking care
4. The healthcare system was not consistently responsive to young women with AMI, resulting in delays in workup and diagnosis.
5. Participants did not routinely access primary care, including preventive care for heart disease (Lichtman et al., 2015, p. 2).

Women presented with atypical symptoms such as pain or discomfort in the back, jaw, or throat as well as headaches, nausea and coughing. These atypical symptoms contributed to the delay in seeking care. Such symptoms were thought of as non-cardiac because of their nature and also the way the media depict stereotypical heart attack symptoms of men.

Findings in the literature have been inconsistent regarding symptom presentation. Coventry, Finn, & Bremner (2011) report that many studies were done on patients diagnosed with ACS and not just using AMI diagnosis as their means to study signs and symptoms for AMI. Other studies for AMI symptoms have been restricted to patients who present with chest pain thus excluding other symptom for potential AMIs. Coventry et al did a systematic review on patients diagnosed with AMI with the aim to answer two main research questions:

1. Do men and women equally present with chest pain as a symptom of AMI?
2. Are there sex differences in other presenting symptoms of AMI?

Researchers used studies from 1990 to 2009 to include 26 articles. The results showed that women are generally older than men, more likely to have a history of CHF, less likely to present with chest pain and more likely than men to present with fatigue, neck pain, syncope, right arm pain, dizziness, and jaw pain.

Khan, Albarran, Lopez, & Chair, (2010) conducted a quantitative, descriptive, prospective research study on characteristics of chest pain experienced by patients during an MI and differences in symptom perception. A total of 128 patients with AMI were in the study and equally divided among men and women. Women were significantly older than men and had a higher incidence of hypertension (75% vs. 42.19%, $p<0.001$). Out of the total study sample 54/64 (83%) of men and 43/64 (67%) of women described chest pain as an initial symptom. Absence of chest pain and presence of atypical sensations across the chest was more common in women than men (n=21 vs. n=10, p=0.016). Women were more likely to report chest discomfort as either pressure, gripping or dull

sensation or to present without pain across the chest. Khan et al., (2010) found no gender differences in chest pain intensity. They found that women experience more radiation of pain to the back of neck, upper abdomen and back. Female patients were more likely to be misdiagnosed, to receive suboptimal care and have higher mortality rates (Khan et al., 2010).

O'Donnell, McKee, O'Brien, Mooney, & Moser, (2012) conducted a prospective cross sectional analysis of baseline data pertaining to symptom experience. A total of 1947 ACS patients were enrolled in the study of which 545 (28%) were women. The female participants were also significantly older than the male participants ($p<.001$). Women reported a greater number of symptoms than males (3.4 vs. 2.9, $p = < .0001$). Chest pain/discomfort was the most commonly reported symptom with no significant difference between gender ($p = .08$) or severity of chest pain ($p = .213$). The researchers found gender differences in symptoms according to the type of MI. Women having a STEMI were more likely than men to report nausea ($p = .007$) and dizziness ($p = .031$). Women having a NSTEMI were more likely than men to report fatigue ($p = .010$), sweating ($p = .017$) and palpitations ($p = .026$). Women experienced more nausea/vomiting, palpations, back pain, and loss of appetite than males in ACS whereas males experienced more diaphoresis and chest pain.

Gimenez et al. (2014) conducted a prospective multi-center study with the aim to improve the management of suspected AMI in women by exploring sex-specific chest pain characteristics (CPC). The study enrolled 2475 patients (796 women and 1679 men) presenting with acute chest pain, of these, 143 women (18%) and 369 men (22%) had a

final diagnosis of AMI. The researchers determined that CPC are not powerful enough in diagnosing AMI and that other interventions need to be used for the diagnosis. The study reports three major findings.

1. Most of the CPCs were reported with similar frequency in men and women, 11 of the predefined 34 CPCs were reported to be significantly different in women and men.
2. Most of the assessed CPCs did not differentiate AMI from other causes of acute chest pain.
3. 31 of 34 CPCs (91%) showed similar likelihood ratios for the diagnosis of AMI in women and men, and only 3 CPCs (8.8%) showed a sex-specific diagnostic performance.

Early recognition and diagnosis is essential in managing patients with ACS in the ED. The EKG is the most widely used initial screening test in patients presenting with ACS due to its ability to show signs of ischemia, and because it is inexpensive, available and non-invasive (Zegre-Hemsey, Sommargren, & Drew, 2011).

Disparity in Treatment

The nurse needs to be skilled, experienced, and vigilant in order to determine the need for an EKG for patients who present with both typical and atypical symptoms (Rohacek et al., 2011). Nurses are usually the first to encounter the patient, therefore need to be familiar with detecting abnormalities on the EKG which represent ischemic changes in order to initiate appropriate interventions to salvage cardiac muscle. The goal is to reduce door to needle time (time of hospital arrival to initiation of fibrinolytics) as well as

door to balloon time (time of hospital arrival to first balloon inflation), before cell death ensues (Docherty, 2003; Zegre-Hemsey, Sommargren, & Drew, 2011).

Time of arrival to an ED to the time of obtaining an EKG is an important quality metric for patients suspected of having ACS (Phelan et al., 2009). The AHA and the ACC guidelines specify that an EKG should be obtained and interpreted within 10 minutes of arrival to the ED in patients with symptoms suspicious of ACS (Zegre-Hemsey et al., 2011). Despite these guidelines, only one third of patients that present with ACS have an EKG within 10 minutes of arrival. Delay in obtaining an EKG is associated with poor clinical outcomes (Zegre-Hemsey et al., 2011).

Several reasons were found for delay in obtaining EKGs; the main reason is that not all patients present with chest pain. Approximately one third of patients with MI do not have chest pain (Glickman et al., 2012). Lack of recognition of symptoms suggestive of ACS, such as shortness of breath (SOB), syncope, weakness or palpitations, was another reason for delays in EKG acquisition (Phelan et al., 2009). Reasons for delays in patients who present with chest pain include finishing the triage process, registration, obtaining an intravenous (IV), no private place to perform EKG and overcrowding of EDs (Glickman et al., 2012; Phelen et al., 2009).

Glickman et al. (2012) conducted a retrospective chart review to develop a practical approach to identify patients, especially those without chest pain, who require an immediate EKG in the ED to identify STEMI. An EKG prioritization rule was derived and validated using classification and regression tree analysis among greater than 3 million ED visits from 107 EDs from 2007 to 2008. The North Carolina Disease Event

Tracking and Epidemiologic Collection Tool (NC DETECT) was used. The study had two goals. The first goal was to describe the presenting symptoms of patients with STEMI by age and gender using an all-inclusive patient population of ED visits across a broad geographic area. The second goal was to develop and validate a decision rule using age and chief complaint data to identify the subgroup of patients who receive an immediate EKG upon ED arrival. The results showed 22% of the patients did not present with the chief complaint of chest pain and that increased to nearly 50% for patients greater than eighty years old. The study confirmed previous findings that women and the elderly with MI are less likely to present with chest pain as their chief complaint. The researchers noted the significance of the information as women and elderly patients are more likely to experience delays in door to EKG and delay in treatment resulting in increased morbidity and mortality (p=.0001). Glickman et al. reported that despite numerous studies over the past decade documenting delays in treatment of patients with atypical acute MI presentations, such as weakness and dyspnea, the problem still persists.

Zegre-Hemsey et al. (2011) conducted a five year prospective randomized clinical trial that enrolled all subjects who called 911 for ischemic complaints in Santa Cruz County, California. The data set included patients 30 years and older. The aim of the secondary analysis of a subset of Synthesized Twelve-lead ST Monitoring and Real-time Tele-electrocardiography (ST SMART) study data were to determine:

1. The rate of adherence to the AHA goals of receiving an EKG in the recommended 10 minutes.

2. Whether there were gender differences in meeting this goal.

A total of 425 subjects were enrolled, 223 men and 202 women. The mean age was 70 years. Women were slightly older. 172 subjects had a final diagnosis of ACS. The mean time to EKG for the total sample was 43 minutes. Only 59% of the patients received an EKG within 10 minutes. Males had a shorter mean time to EKG of 34 minutes versus females of 53 minutes (p=.001). Only 32% of females received an EKG within the recommended 10 minutes. Gender was found to be an independent predictor for time to EKG. Several factors may have contributed to the gender difference such as atypical symptoms in women, many women have presented to the ED after symptom resolution and finally the logistics behind providing a private location for obtaining an EKG in women.

Diercks et al. (2005) conducted a retrospective study to determine the frequency of electrocardiographic acquisition within 10 minutes of hospital arrival, factors associated with delayed EKG acquisition, and any relation among delayed EKG acquisition, treatment patterns, and clinical outcomes. The data from patients who were enrolled in the CRUSADE (Can Rapid Risk Stratification of Unstable Angina Patients Suppress Adverse Outcomes with Early Implementation) quality improvement initiative from February 2001 to March 2004 was analyzed. The final patient participants consisted of 63,468 patients (26,615 women, 42%). In the cohort 22,081(34.8%) patients had an EKG within 10 minutes and 41,397 (65.2%) did not (p=<0.001). The factor most strongly associated with delayed EKG acquisition was female gender which far exceeded the association with other factors. Possible explanations for the delay may include atypical

presentation of ACS in women, women present after symptoms have resolved and the logistical need for a location that allows for patient privacy in obtaining an EKG.

Yates & Hiestand, (2011) conducted a retrospective cohort study of patients presenting to the ED with non-ST elevation acute coronary syndrome (NSTACS). Inclusion required EKG changes or elevated cardiac biomarkers. The hypothesis was that within a single center, demographic characteristics would not influence door-to-EKG time in ED patients with NSTACS. The study was done in an academic urban Midwestern university-affiliated tertiary referral center with an annual census 58,000 visits. There were 247 patients who met the inclusion criteria. The mean door to EKG time for whites was 23.1 minutes and non- whites 29.9 minutes. The mean door to EKG time for males were 24.6 minutes and females 27.1 minutes ($p=0.82$). The study's conclusion was that there is no influence of age, race or sex on time to EKG in patients with NSTACS presenting to the ED.

In summary, the importance of early diagnosis of AMI is essential for a better outcome and prognosis for the patient. The literature demonstrated a greater number of females being under diagnosed and therefore having greater morbidity and mortality than men. Cardiac disease is not a man's disease and more attention and education should be focused on symptomology not just for females but for both males and females. Time is muscle. Presenting early to an ED and immediate EKG acquisition is crucial in determining the need for advanced treatment.

Theoretical Framework

The theoretical framework for this research is the Synergy Model for Patient Care. The model was developed by the American Association of Critical-Care Nurses in 1990 and revised in 2005. The underlining basis of the model is that patients' characteristics drive nurses' competencies. The model identifies eight patient needs or characteristics: resiliency, vulnerability, stability, complexity, resource availability, participation in care, participation in decision making and predictability. The eight competencies of nurses in critical care situations include clinical judgment, clinical inquiry, facilitation of learning, collaboration, systems thinking, advocacy and moral agency, caring practices, and response to diversity. The Synergy Model also describes three levels of outcomes; those relating to the patient, the nurse and the system. According to the Synergy Model, when patients' characteristics and nurses' competencies match and synergize, patients' outcomes are optimized (McEwen & Willis, 2011). The nurses' competencies are derived from the patients' needs. All eight are critical competencies in order to provide the best care to the patients and their families. For the purposes of this research, the competencies of clinical judgment (which includes clinical decision making, critical thinking, and a global grasp of the situation), coupled with nursing skills and collaboration with others to achieve the optimal goal, are critical.

The synergy model can be applied to the project in that it identifies the patients' needs which in turn will drive the nurses' competencies to use clinical judgment, clinical inquiry, collaborating with other team members such as the ED doctor, cardiology and the catheterization personnel. The synergy model was useful in guiding the research for

many reasons. It takes a skilled clinical nurse to recognize atypical cardiac symptoms and use critical thinking skills to make appropriate decisions as to what to do next. Patients are particularly vulnerable when entering into any healthcare environment and want to know that they will be able to participate in their care and that they are part of the decision making. The patient needs to feel comfortable that the system will be able to provide competent critical care, and trust that the nurse uses competent clinical judgment to recognize the signs and symptoms to be cardiac related.

Methodology

Purpose/Question

The purpose of this project was to distinguish if a disparity between genders in best practice of "door to EKG in 10 minutes" exist in the ED. It was proposed that there is a gender disparity resulting in a delay in EKG time for females.

Design

The study was designed as a two group retrospective chart review. Group one consisted of males diagnosed with AMI and group two were females diagnosed with AMI. Both groups included patients who presented to the ED with chest pain symptoms and atypical symptoms suggestive of AMI and that required an EKG.

Sample/Participants

A convenience sample was derived from a review of medical records by using the ICD code for diagnosis of AMI, STEMI and NSTEMI. Inclusion criteria included subjects over the age of 18 who were diagnosed with AMI, STEMI, and NSTEMI with an equal sample of males and females. Exclusion criteria included patients with a history of MI, diabetes and patients who presented to the ED by emergency medical services (EMS). Patients with a previous history of MI will get an EKG by history alone. Patients with diabetes present with different signs and symptoms and initially a MI may be missed which can cause the data to be skewed. Patients who presented to the ED by EMS will usually have an EKG done with an interpretation while in route to the hospital.

Site

The study was conducted at Miriam Hospital in Providence RI. The Miriam Hospital (TMH) is a major teaching hospital for Brown University Medical School. Miriam is a 247 bed acute care facility that saw over 58,000 patients in the ED in the year 2014, approximately 385 were AMIs.

Procedures

Approval from the Lifespan and Rhode Island College (RIC) Institutional Review Board (IRB) was obtained. A list of potential subjects who had an AMI, STEMI and NSTEMI was obtained using an ICD code from the medical record. The data was collected at The Miriam Hospital in one day. No personal health information (PHI) was recorded. The data was stored in a locked file to which only the primary researcher had access to. The data remained confidential. The sample size included 30 males and 30 females with diagnosis of AMI, STEMI or NSTEMI.

The data was collected by the researcher. Approximately 261 electronic medical records (EMRs) were reviewed from the dates January 1, 2014 to December 31, 2014 to obtain the desired sample size of 30 EMRs for each gender. The EMRs were reviewed looking for patients who had a diagnosis of MI and or diabetes and these records were excluded. The records were also reviewed to see the method of arrival and those that arrived by EMS were excluded. Once the project was completed the data was shredded.

Measurements

A data collection tool was developed and used to collect data (Appendix). The tool included time of arrival, time of EKG, gender, age, presenting complaint, and

admission diagnosis. Time differences between the groups were compared using mean and range to compare the data.

Organizational/system factors

The Miriam Hospital (TMH) uses electronic medical records and these were used to gather information from the medical records. Factors enabling the project included easy access to records, administrative support and technical support. At the time the research was done the TMH used med host as their electronic medical record making data collection easier. The chief nursing administrator supported and approved the project and allowed access to data collection. Factors that may have been barriers to this project included: limited time to collect data; implementation of a new electronic medical record at The Miriam Hospital; and limited sample size.

Ethical concerns

It was important when reviewing personal health information in the medical records to maintain confidentiality. IRB approval was obtained. There were no cultural issues identified.

Data Analysis

Basic descriptive statistics were used to analyze the study variables including percentages, the range and mean scores. The average time from door to EKG was analyzed comparing the two groups.

Results

A total of 261 charts were reviewed to obtain a cohort of 30 females and 30 males who had an AMI. Out of the 261 charts, 167 were excluded due to arrival by EMS. There were 94 subjects who walked in, of which 34 were excluded because they had a past diagnosis of diabetes and/or MI. A cohort of 30 males and 30 females were obtained. The arrival time to the ED and the time of initial EKG was recorded and the time difference was calculated. The minute average for males was 15.6 minutes as compared to the minute average of females of 18.43 minutes from door to EKG. Thirty two percent of all patients (n=19) had an initial EKG in 10 minutes or less. Figure 1 illustrates the comparison of male to female door to EKG time. Figure 2 illustrates average time to EKG.

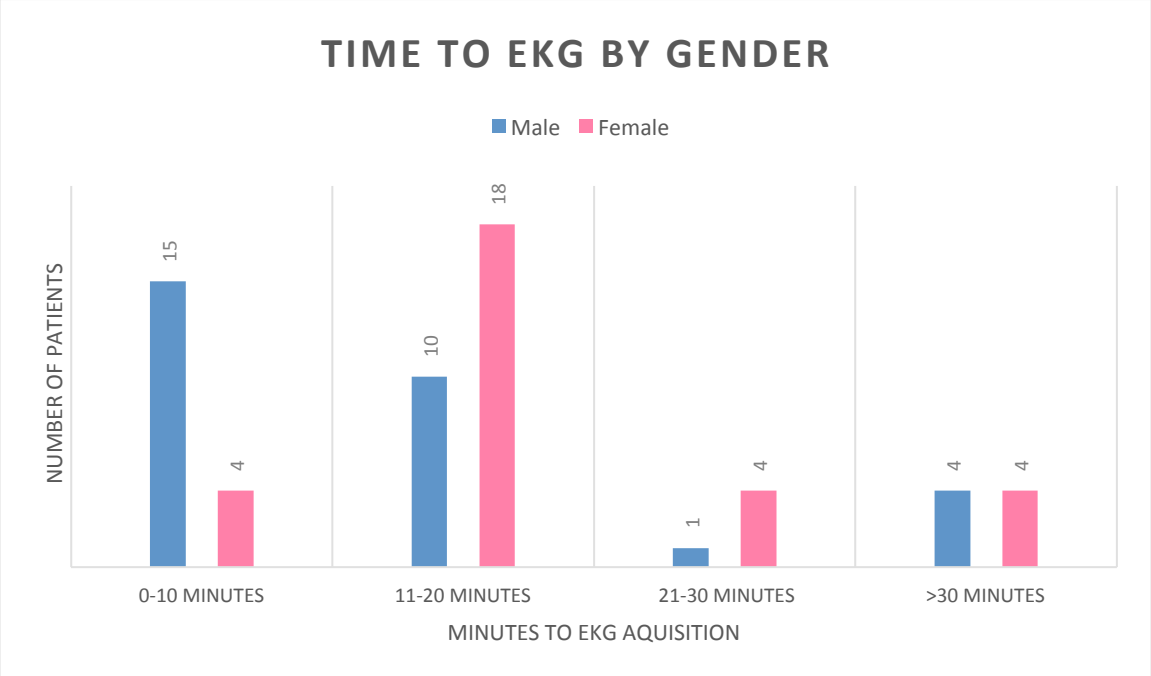

Figure 1. Comparison of male to female door to EKG time.

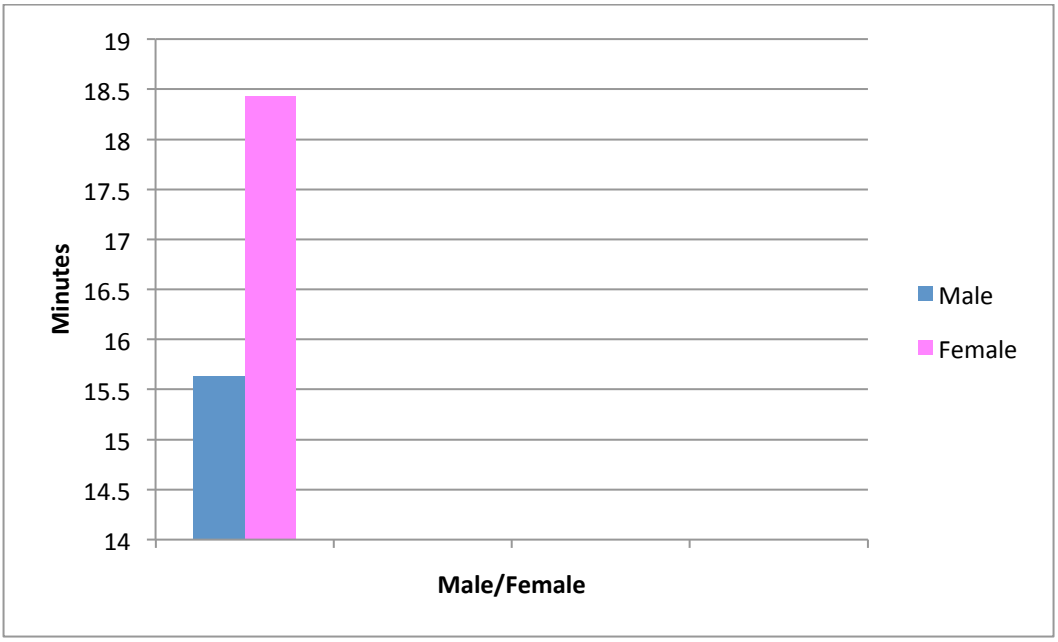

Figure 2. Average time (minutes) to EKG.

Fifty percent of the males (n=15) had an EKG done in 10 minutes or less compared to only 13% of the females (n= 4). Males had 33% (n=10) and females had 60% (n=18) of EKGs in 11 to 20 minutes. Thirteen percent of both groups (n=4 in each group) had an EKG in greater than 30 minutes, of which none had a chief complaint of chest pain. The chief complaints of individuals who had their EKGs in greater than 30 minutes were abdominal pain, weakness, dizziness, dyspnea, body aches, and abnormal labs. The time range to EKG for male patients was 0 minutes to 76 minutes. Time range to EKG for females was 5 minutes to 46 minutes.

There was a total of 14 STEMIs, 57% were males (n=8), and 43% were females (n=6). The male patients with STEMIs all received a EKGs in less than 10 minutes. Only one female STEMI patient had an EKG in less than 10 minutes, two in less than 20 minutes, and three were done in 25 minutes and longer. One male patient with a STEMI

presented with dizziness/shortness of breath, the rest (n=7) had chief complaint of chest pain. Two females with STEMI presented with abdominal pain and the other had body aches, the rest (n=4) had chief complaint of chest pain. 67% (n=20) of females and 60% (n =18) of males presented with chest pain, 33% (n=10) of females and 40 % (n=12) of males presented with other chief complaints. The average age for males was 62 years with a range of 32 years to 85 years as compared to average age for females of 72 years with a range of 44 years to 92 years.

Summary and Conclusion

Cardiovascular disease is the leading cause of death around the world ("WHO," 2013). Men and women are equally affected and both lack the knowledge of symptom presentation and risk factors for heart disease causing a delay in seeking care. Reasons for delay in obtaining EKGs may be that not all patients present with chest pain. Some patients may present with dyspnea, syncope, weakness and palpitations all of which are symptoms suggestive of ACS. Patients who present with chest pain may also have a delay in EKG acquisition due to such factors as trying to complete the triage and registration process or obtaining intravenous access, no private place to perform EKGs or overcrowding. The recognition of patients with cardiac related signs and symptoms is critical for obtaining an initial EKG. The EKG has become the most common critical cardiovascular diagnostic tool used in the ED to diagnose AMI (Kligfield et al., 2007). The AHA and ACC recommend time of arrival to an ED to EKG to be within 10 minutes (AHA, 2013). Delay in EKG acquisition causes delay in life saving interventions to include cardiology consults, thrombolytics, and cardiac catheterizations. Delays in these interventions cause increase morbidity and mortality.

The purpose of the project was to distinguish if a disparity between genders in best practice of "door to EKG in 10 minutes" exist in the ED. It was proposed that there is a disparity in that females have a delay in EKG time. The study was guided by The Synergy Model for Patient Care. A retrospective chart review was conducted; 261 charts were reviewed of which 30 females and 30 males met the inclusion criteria. The data demonstrated that 50% (n=15) of males had an initial EKG acquisition within 10 minutes

compared to 13% (n=4) of females. The majority of females 60% (n=18) had an initial EKG in 11 to 20 minutes in comparison to males who had 33% (n=10) in this time frame. The data showed that females do have a delay in initial EKG acquisition as compared to males. Due to the retrospective design there is no way of telling what causes this delay. The majority of women had their first EKG in 11 to 20 minutes which could be indicative of finding a private place to do the EKG. More studies will need to be done to observe the process and reasons for the delays. There were a total of 14 STEMIs 57% (n=8) were male and 43% (n=6) were females. All of the males who had a STEMI had an EKG in 10 minutes or less but only one of the females who had a STEMI had an EKG in less than 10 minutes, two in less than 20 minutes one less than 30 minutes and two were done at 46 minutes. The two at 46 minutes did not have a chief complaint of chest pain, one was abdominal pain and the other was body aches, the other four had a chief complaint of chest pain. The one male who had a STEMI presented with SOB and dizziness was 45 years old, had initial EKG in zero minutes meaning the EKG was done as soon as he walked through the door. Though males and females can present with different complaints their appearance may reveal the severity of the symptoms. It is unclear why all the males who had STEMIs were able to get their initial EKG done in the recommended 10 minutes yet females who presented with chest pain , had a diagnosis of STEMI were not able to get their EKG done in the recommended 10 minutes. The data reveals there is a disparity but it does not reveal why the disparity exist. Observational studies will need to be done to reveal other characteristics the patient presents with other than their chief complaint. Thirteen percent of each group (males n=4, females n=4) had

an EKG in greater than 30 minutes, of which none had a chief complaint of chest pain. The chief complaints were abdominal pain, weakness, dizziness, dyspnea or shortness of breath, body aches, and abnormal labs. These chief complaints are atypical and caused a delay in the initial EKG acquisition for males and females. The fact that the two females in this group, that had STEMIs, were not identified as having an AMI earlier is unclear. As reported in previous studies females tend to be older than males. The data in this study revealed that women were older with the average age of females 72 years compared to males at 62 years. The data demonstrated that males tend to -receive EKGs quicker than females but the study is limited by the retrospective design and being unable to examine the reasons that caused the delays. The literature review acknowledged that some patients present with complaints other than chest pain and that it tends to be females that present with atypical chest pain. The data for this study revealed that 67% (n=20) of females and 60% (n =18) of males presented with chest pain, 33% (n=10) of females and 40 % (n=12) of males presented with other chief complaints. The data differed from the literature review in that females present more often with complaints other than chest pain.

The study was limited by factors associated with a retrospective design. Factors that could not be measured such as acuity of patients, overcrowding, private areas for acquisition and nursing education, may have attributed to the delay in EKG acquisition. The study was also limited by a relatively small sample size of 60 subjects and the data being collected at only one facility.

Recommendations and Implications for Practice

Delay in initial EKG acquisition can be detrimental to the patient, family and facility causing increase morbidity, mortality and cost to the health care system. The advanced practice registered nurse (APRN) is in a unique position to initiate efforts to establish a process to decrease time to initial EKG. The APRN as members and leaders of the interdisciplinary team can be influential in policy development, advocating for practice change and working within teams to promote early EKG acquisition at triage. The APRN should work with members of the triage team to examine organizational and system issues that contribute to prolong EKG acquisition. Once identified, and with administrative support, strategies to minimize time to initial EKG can be implemented and evaluated resulting in better outcomes. APRNS as role models for practicing nurses have an important opportunity to educate nurses in the diverse presentation of patients with ACS. APRNs can be instrumental in the development and implementation of evidenced based research into practice which will drive practice improvement and benefit the patient, family and facility. Further practice change and research is needed to determine why initial EKG acquisition is taking longer than the recommended ten minutes and to investigate whether this impacts outcomes.

APRNs have a key role in advocating for policy change at the state and national level. Staying involved in professional associates will keep the APRN up to date with current trends, practices and current legislation, rules and regulations.

Plan for dissemination

The data was examined and will be presented to the ED director to see how the process of triaging patients and obtaining EKGs can be improved. The research will be submitted to digital commons at RIC and presented to student population and faculty at RIC at the Graduate Studies Symposium in May, 2015.

In conclusion, the research project revealed that there is a disparity between genders in initial EKG acquisition. What the project did not reveal is why there is a disparity. As an APRN it is important to take knowledge learned and advance this knowledge through research to find a way to better improve current protocol and practices to improve patient outcomes. Additional research needs to be done to see why there is a delay in initial EKG acquisition, not just for females but for both males and females.

References

American Heart Association. (2013). Recommendations for criteria for STEMI systems of care. Retrieved from http:www.heart.org/idc/groups/heart-public/@wcm/@hcm/@ml/documents/downloadable/ucm_424485.pdf

Centers for Disease Control and Prevention. (2011, September 13). Million hearts: strategies to reduce the prevalence of leading cardiovascular disease risk factors-United States, 2011. *Morbidity and Mortality Weekly Report*, *60*, 1-4.

Centers for Disease Control and Prevention. (2013a). Women and heart disease fact sheet. Retrieved from www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_women_heart.htm

Centers for Disease Control and Prevention. (2013b). Preventable death from heart disease & stroke. Retrieved from http://www.cdc.gov/vitalsigns/heartdisease-stroke/index.html

Chen, W., Woods, S. L., & Puntillo, K. A. (2005). Gender differences in symptoms associated with acute myocardial infarction: A review of the research. *Heart & Lung: The Journal of Acute & Critical Care*, *34*, 240-247.

Coventry, L. L., Finn, J., & Bremner, A. P. (2011). Sex differences in symptom in acute myocardial infarction: A systematic review and meta-analysis. *Heart & Lung: The Journal of Acute & Critical Care*, *40*, 477-491.

Diercks, D. B., Peakock, F., Hiestand, B. C., Chen, A. Y., Pollack, C. V., Kirk, D., ... Roe, M. T. (2005). Frequency and consequences of recording an electrocardiogram >10 minutes after arrival in an emergency room in non-st-

segment elevation acute coronary syndrome (from the crusade initiative). *The American Journal of Cardiology*, *97*(4), 437-442.

Docherty, B. (2003). 12-lead ECG interpretation and chest pain management: 1. *British Journal of Nursing*, *12*(21), 1248-1255.

Gimenez, M., Reiter, M., Twerenbold, R., Reichlin, T., Wildi, K., Haaf, P., ... Mueller, C. (2014). Sex-specific chest pain characteristics in the early diagnosis of acute myocardial infarction. *JAMA Internal Medicine*, *174*, 241-249.

Glickman, S. W., Shofer, F. S., Wu, M. C., Scholer, M. J., Ndubuizu, A., Peterson, E. D., ... Glickman, L. T. (2012). Development and validation of a prioritization rule for obtaining an immediate 12-lead electrocardiogram in the emergency department to identify ST-elevation myocardial infarction. *American Heart Journal*, *163*, 372-382. Retrieved from http://www.medscape.com/viewarticle/760645_print

Jensen, L. A., & Moser, D. K. (2008). Gender differences in knowledge, attitudes, and beliefs about heart disease. *Nursing Clinics of North America*, *43*(1). http://dx.doi.org/10.1016/j.cnur.2007.10.005

John Hopkins Medical. (2013). Myocardial infarction. Retrieved from www.hopkinsmedicine.org/heart_vascular_institute/conditions_treatments/conditions/myocardial_infarction.html

Khan, J. J., Albarran, J. W., Lopez, V., & Chair, S. Y. (2010). Gender differences on chest pain perception associated with acute myocardial infarction in Chinese patients: A questionnaire survey. *Journal of Clinical Nursing*, *19*, 2720-2729.

Kligfield, P., Gettes, L. S., Bailey, J. J., Childers, R., Deal, B. J., Hancock, E., ... Wagner, G. S. (2007). Recommendations for the standardization and interpretation of the electrocardiogram. *JACC Journals*, *49*(10). Retrieved from http://content.onlinejacc.org/article.aspx?articleid=1188784

Lichtman, J. H., Leifheit-Limson, E. C., Watanabe, E., Allen, N. B., Garavalia, B., Garavalia, L. S., ... Curry, L. A. (2015). Symptom recognition and healthcare experiences of young women with acute myocardial infarction. Retrieved from http://circoutcomes.ahajournals.org

Mayo Clinic. (2014). Heart disease definition-diseases and conditions. *Mayo Clinic*. Retrieved from http://www.mayoclinic.org/diseases-conditions/heart-disease/basics/definition/con-20034056

McEwen, M., & Wills, E. M. (2011). *Theoretical basis for nursing* (3rd ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

National Institutes of Health. (2012). Electrocardiogram. Retrieved from http://www.nlm.nih.gov/medlineplus/ency/article/003868.htm

Nguyen, H. L., Saczynski, J. S., Gore, J. M., & Goldberg, R. J. (2010). Age and sex differences in duration of prehospital delay in patients with acute myocardial infarction: A Systematic review. *Circulation: Cardiovascular Care and Outcomes*, *3*, 82-92.

O'Donnell, S., McKee, G., O'Brien, F., Mooney, M., & Moser, D. K. (2012). Gendered symptom presentation in acute coronary syndrome: A cross sectional analysis. *International Journal of Nursing Studies*, 1325-1332.

Phelan, M. P., Glauser, J., Smith, E., Martin, C., Schrump, S., Mahone, P., & Peacock, F. W. (2009). Improving emergency department door-to-electrocardiogram time in ST segment elevation myocardial infarction. *Critical Pathways in Cardiology: A Journal of Evidenced-Based Medicine*, *8*(3), 119-121.

Rohacek, M., Bertolotti, A., Grutzmuller, N., Simmen, U., Marty, H., Zimmermann, H., ... Spyridon, A. (2011). The challenge of triaging chest pain patients: The Bernese University hospital experience. *Emergency Medicine International*, *2012*().

The Society for Cardiovascular Angiography and Interventions. (2015). Types of heart attacks. *Seconds Count.org*. Retrieved from http://secondscount.org/heart-condition-centers/info-detail?cid=c1753748-5871-4b3b-a883-934b83044feb

Turris, S. A. (2008). Women's decisions to seek treatment for the symptoms of potential cardiac illness. *Journal of Nursing Scholarship*, 5-12.

Underwood, C. (2006). Essential differences Women and cardiac disease. *Canadian Journal of Health & Nutrition*.

Wagner, G. S., Macfarlane, P., Wellens, H., Josephson, M., Gorgels, A., Mirvis, D. M., ... Gettes, L. S. (2009). AHA/ACCF/HRS Recommendations for the standardization and interpretation of the electrocardiogram. *JACC Journals*, *53*(11). Retrieved from http://content.onlinejacc.org/article.aspx?articleid=1139535

World health organization cardiovascular disease fact sheet. (2013). Retrieved from www.who.int/mediacentre/factsheets/fs317/en/

Yates, R. B., & Hiestand, B. C. (2011). Effects of age, race, and sex on door-to-electrocardiogram time in emergency department non-st elevation acute coronary syndrome patients. *The Journal of Emergency Medicine*, *40*(2), 123-127.

Zegre-Hemsey, J., Sommargren, C. E., & Drew, B. J. (2011). Initial ECG acquisition within 10 minutes of arrival at the emergency department in persons with chest pain: Time and gender differences. *Journal of Emergency Nursing*, *37*(1), 109-112.

Appendix

Time of arrival	Time of EKG	Gender	Age	Presenting Complaint	Admission Diagnosis