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Clinical Presentation of Acute Coronary Syndrome: Does Age Make a Difference? Implications for Emergency Nursing

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CLINICAL PRESENTATION OF ACUTE CORONARY SYNDROME: DOES AGE MAKE A DIFFERENCE?

IMPLICATIONS FOR EMERGENCY NURSING

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science

By

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ABSTRACT

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Accurately recognizing symptoms of Acute Coronary Syndrome (ACS) presents a challenge to Emergency Department (ED) nurses and physicians. Due to the variety of clinical presentations in patients, ACS is frequently missed diagnosed. Studies demonstrate that many patients present with atypical symptoms and presentation varies based on gender. There is, however, a paucity of studies on the presentation of ACS in the elderly. With the older American population growing at exponential rates, it is imperative that studies are conducted to better comprehend ACS clinical presentation in the elderly. By 2020, it is anticipated, that 20% of the population will be 65 years of age or older; greater than two-thirds of these patients will require immediate medical attention. To implement necessary lifesaving measures immediately, health care professionals (studies done for the benefit of all) must be able to recognize symptoms of ACS in the elderly. Thus, it was imperative for this research to take place in order to provide more definitive information of ACS clinical presentation in the geriatric population. Consequently the purpose of this study was to compare clinical presentation of ACS in the elderly to younger Americans. Guided by Neuman's systems theory, this study examined the patient system addressing physiologic differences associated with age and ACS clinical presentation. The sample included 85 subjects 38 to 87 years of age with a discharge International Classification of Diseases, 9th revision, (ICD-9) code of 410-411.1 (excluding 411.0) during the specified time frame. Clinical manifestations documented included chest pressure, dyspnea on exertion, neck pain, syncope,

palpitations, reflux, and arm numbness. Comorbidities included hypertension (37%), hyperlipidemia (27%), diabetes mellitus (15%) and previous cardiac history (26%). Findings suggested that chest pain was the most commonly reported ACS clinical manifestation. The chief complaint was not different by age group ($\chi^2 = 6.984$; phi= .363; p=.727). There were no significant statistical differences in clinical presentation by age. Further studies are needed to ascertain clinical manifestations of ACS with regard to age.

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This thesis is dedicated to my supportive parents, family, and friends. I must first give thanks to God for giving me the strength and wisdom required to accomplish such an honored achievement. Next, I must thank my "fallen angel", my Daddy, Mr. Robert Harris, may his soul rest in peace. I could feel his loving arms comforting me during moments of doubt and frustration. My mommy, Elise Harris, never let me miss a beat. Her tough love certainly paid off. Last, but certainly, not least, I must give thanks to my loving family/friends: My brothers, Rasheem and Robert E. Harris, Ms. Jean Renfroe ("Auntie"), Mrs. Priscilla Jennings (cousin), Ms. Constance D. Padmore (sister), Nicole M. Wilson (dear friend) and Mr. James Mason (dear friend).You all have been the wind beneath my wings helping me soar to higher levels of success. Each of you will always have a special place in my heart. I am so thankful to have you all in my life. I now know, "if you can believe it, you can achieve it". Many blessings!

I. INTRODUCTION

As more elderly patients present to Emergency Departments (ED) with atypical clinical manifestations of Acute Coronary Syndrome (ACS), prompt recognition of symptom presentation is imperative. Every 30 minutes that elapses from the time of symptom onset to treatment places elderly patient s at a *greater* risk of dying (American Heart Association [AHA], 2005). A need to improve ACS symptom recognition in the elderly is well documented by the fact that ED nurses failed to recognize ACS manifestations in 42% of their patients (Arslanian-Engoren, 2004). Further, it has been documented that, annually, 5.3% of ACS diagnoses are missed by physicians (Christenson, et al., 2004). ED nurses have been known to bias triage decisions based on age and gender (Arslanian-Engoren, 2000). Such disparities have led to faster treatment of elderly patients and increased wait-times in younger populations. In one study (Arslanian-Engoren, 2000), nurses found elderly patients to present with vague symptoms of ACS. In fact, more atypical presentations of cardiac symptoms were found with the increasing age of men. According to the AHA, more elderly die of cardiac related deaths than from any other medical conditions. It has been documented that over 83% of patient s 65 years of age or older die from heart disease. Researchers have suggested that such high mortality rates may be due to multiple existing comorbidities found in the geriatric population. With the rise of an aging population, further studies must be conducted to identify ACS manifestations accurately in the elderly. Since heart disease is the number one killer of adults in the United States (AHA), healthcare providers, particularly triage nurses, must be prepared to assess ACS symptoms accurately and immediately initiate further diagnostic evaluations. Therefore, the purpose of this study was to identify ACS clinical presentation differences found in the elderly and younger patient populations.

Problem Background

In 2002, cardiovascular disease was the cause of 38% of all deaths in the United States (U.S.). Thus, one out of every 2.6 deaths in the U.S was due to cardiovascular disease. An estimated 70 million Americans have one or more types of cardiovascular disease including coronary artery disease, hypertension, and stroke. Nearly 2,600 Americans die each day of cardiovascular disease; averaging one death every 34 seconds (AHA, 2005). With an increase in mortality rates, recognition of ACS symptoms becomes more critical. The AHA recognized typical symptoms of ACS to be chest discomfort, discomfort to other areas of the upper body, shortness of breath, cold sweat, nausea, or lightheadedness. The American College of Cardiology (ACC) defined atypical symptoms as epigastic, arm, shoulder, wrist, jaw, or back pain without complaints of chest pain (Alpert, et al., 2000).

Although many studies have addressed gender differences in presentation of ACS, there is a paucity of information regarding differences in age-related presentation. Multiple studies have recognized atypical presentation in the female population. Rosengren, Wallentin, and Gitt, et al. (2004) found that younger women present with less ST segment elevation and more unstable angina. It is also known that clinical features alone have a limited role in recognition of ACS. One study conducted by Culic, et al. (2002) found atypical ACS presentation in women with a history of diabetes. Although many healthcare providers perceive pain as a major symptom of ACS, studies have shown otherwise. Coronado, Hector, Griffin, Beshansky, and Selker (2004), found that 6.2% of patient s with ACS were pain free. Other studies have demonstrated that up to 30% of patient s with ACS present to the ED without complaints of chest pain. Gupta, Tabas, and Kohn (2002), reported that 47% of patients

subsequently diagnosed with an Acute Myocardial Infarction (AMI) were pain free at the time of presentation.

Statement of the problem

The United States population increased three-fold from 1900 to 1990. During this same time frame the population of individuals 65 years of age or older increased ten-fold. It is estimated that by 2020, 53 million Americans are expected to be 65 years of age or older (AHA, 2005). With the elderly populace increasing along with their comorbidities, it is crucial for health care providers to recognize ACS symptoms specific the geriatric population.

Measures must be taken to decrease the incidence of premature cardiac deaths. In 2002, 32% of cardiovascular deaths occurred prematurely, before the individual reached 75 years of age (AHA, 2005). As a call for nationwide acknowledgement to this problem, Healthy People (HP) 2010 (U.S. Department of Health and Human Services [USDHHS], 2000) recognized heart disease as one of the most significant preventable health threats; as a result, nation wide goals were set to decrease the incidence of cardiac deaths. Increasing educational awareness for the American population is necessary in order to aid in decreasing mortality and morbidity related to ACS.

As previously noted, there has been an increase in the incidence of missed ACS diagnoses. Studies have shown that triage nurses did not recognize ACS clinical manifestations in 42% of patients subsequently diagnosed with ACS (Arslanian-Engoren, 2004). Studies have also revealed that 5.3 % of ACS cases are misdiagnosed and 37% of patients are unnecessarily admitted to the hospital (Christenson, et al., 2005). Aufderheide et al. (2000) reported that 22% of patients with unstable angina were mistakenly discharged to home from the ED.

Study Purpose

The purpose of this study was to analyze the relationship between age and ACS clinical presentation. Recognition of such information can heighten nursing awareness of varied ACS clinical manifestations and allow nurses to implement life saving measures aggressively.

Significance and Justification

Significance

HP 2010 (USDHHS, 2000) recognizes the risk of cardiac death as a threat to national health. One of the main goals of HP 2010 is to increase awareness of early warning signs of heart attack. Increasing awareness of early warning signs can aid in decreasing the average ED wait time from triage to treatment. One study conducted by Brieger, et al. (2004) found that symptoms of ACS were not initially recognized in 23.8 % of patients reporting to EDs. With one cardiac death occurring every 34 seconds (AHA, 2005), it is imperative that nurses acknowledge the importance of recognizing ACS symptoms.

Justification

In 2002, there were approximately 110.2 million ED visits. An estimated, 919,000 visits required immediate attention. Chest pain accounted for nearly one-fifth of all ED visits requiring immediate attention (McCraig & Burt, 2004). It is estimated that each year, 400,000 to 460,000 people will die of heart disease in an ED or before they reach a hospital (AHA, 2005) accounting for 60% of all cardiac deaths. This statistic alone makes it imperative for nurses to sharpen their assessment skills in order to identify individuals who will require urgent physician attention and implementation of immediate lifesaving measures. In 2002, cardiovascular disease was a primary or contributory cause of death on an estimated 1,400,000 death certificates. Coronary disease claims more lives than cancer, lower respiratory disease,

diabetes mellitus, influenza, and pneumonia combined (AHA, 2005). Because cardiovascular disease is recognized as a national health threat, particularly to our growing geriatric population, there is no doubt that this is an area of concern for many Americans, especially health care providers.

Research Questions

In order to ascertain differences in ACS clinical manifestations of the elderly and younger subjects, the researcher identified the following questions:

1. When compared to younger patient s, how does ACS clinical presentation differ in the *elderly* patient?
2. Is age related to clinical *presenting symptoms* of ACS?
3. What are the most common clinical presentations of elderly patients with symptoms of *ACS*?
4. How much time elapses between triage and physician assessment?

Definition of Terms

Terms defined for this study included ACS, ACS presentation, and elderly.

Acute Coronary Syndrome (ACS):

Theoretical: An umbrella term used to cover any group of clinical symptoms compatible with acute myocardial ischemia. Acute myocardial ischemia is considered to produce chest pain due to insufficient blood supply to the heart muscle that results from coronary artery disease. ACS encompasses the spectrum of clinical conditions which range from unstable angina to non-Q-wave myocardial infarction and Q-wave myocardial infarction. ACS is also recognized as unstable angina, or chest pain, and heart attack (AHA, 2005).

Operational: In this study, ACS was representative of any patient with a hospital visit captured by ICD-9 codes (appendix A) 410-411.1 (excluding code 411.0).

ACS Presentation:

Theoretical: Symptoms noted when the patient arrived to the ED or clinical appointment to include chest discomfort, discomfort to other areas of the upper body, shortness of breath, cold sweat, nausea, or lightheadedness (AHA, 2005).

Operational: For purposes of this study presenting symptoms were any symptoms a patient discussed while visiting with their healthcare provider. Identified symptoms were retrieved from documentation in the patient's medical record.

Elderly:

Theoretical: The definition of elderly differs dependent on the source. The age of elderly was quantified as early as 60 years of age. Elderly is defined as "an aged member of society" (www.hyperdictionary.com). The Social Security Administration recognized someone who is "aged" as an individual who is 65 years of age or older (www.ssa.gov).

Operational: Any individual 65 years of age or older.

Assumptions

- Patient s complaints were documented exactly as stated by the patient
- Physician diagnoses of ACS were accurate based on detailed clinical assessment and extensive diagnostic evaluations
- Healthcare professionals accurately annotate patient signs and symptoms

Summary

In the U.S. cardiovascular disease is the number one reason for death in adults. It is imperative that triage nurses recognize ACS symptoms when patient s present to the ED. Increasing numbers of elderly patients are reporting to EDs with atypical presentations of ACS. With our geriatric population increasing rapidly, it is becoming more important for ED nurses to be aware of the varied clinical presentations of ACS. In order to maximize awareness on ACS clinical presentation, this research must take place. This study was also necessary to heighten awareness of ACS clinical manifestations, decrease triage to treatment times, and ultimately decrease mortality and morbidity rates.

The subsequent chapter will discuss current research related to the clinical presentation of ACS. The research was synthesized and categorized according to subject. A conceptual framework of Neuman's System theory is also provided in the following chapter.

II. REVIEW OF LITERATURE

This chapter provides a synthesis of recent research found with respect to ACS clinical manifestations. Concepts which are critical to the study of this phenomenon include age, clinical presentation, and decision making. Each concept is individually discussed. A discussion of Neuman's system theory and its relevance to this research accompanied with a pictorial schematic is also provided within this chapter.

A plethora of studies were examined to ascertain variability of ACS clinical presentation. Twenty-one published empirical and research studies will be included and synthesized in this document. Collection of literature was conducted utilizing a computerized search of databases. Databases used included Cumulative Index of Nursing and Allied Health Literature (CINAHL), Pre CINAHL, Pub Med, Medline, and Abstract premier. Studies reviewed were published from 1996 to 2005. Keywords used during the search included triage, emergency nursing, patient outcomes, ACS, age, pathophysiology, and elderly. Studies are categorized by age, clinical presentation, and decision making processes.

Clinical Presentation of ACS

Gupta, Tabas, and Kohn (2002), conducted a retrospective, cross sectional study over a five year period. The study aimed to determine occurrence rates and predictors of clinical presentation for patients' reporting to an ED without complaints of chest pain who were subsequently admitted with a diagnosis of an AMI. This study was conducted at the ED of a large urban public teaching hospital using 75 randomly selected charts. A database query was performed, selecting results of 721 patients who received a diagnosis of an AMI within the noted five year time period. Researchers hypothesized that this population of urban patients studied would have higher rates of presentations without chest pain. The study found that

women and older patients were more likely to present without complaints of chest pain. Forty seven percent of the patients' did not complain of chest pain. An estimated 17% of patients acknowledge shortness of breath, 95% CI (14%-20%), as their chief complaint. Multivariate odds ratios were calculated for the presentation without chest pain in non-Caucasian women and older age populations which revealed a multivariate OR of 5.75, 95% CI (3.06%-10.83%) in patients older than 84 years of age and OR=1.59, 95% CI (1.11%-2.28%) for female patients. Other presenting symptoms noted were cardiac arrest which was found in 7% of the patients, dizziness, weakness, or syncope (4%), and 2% complained of abdominal pain. The authors concluded that atypical symptoms were higher in this urban population than in the general ED populace.

Milner, Funk, Arnold, and Vaccarino (2001), conducted a prospective study at the Yale-New Haven University hospital ED during September 1995 and August 1997. The objective of this study was to assess the function of a set of typical and atypical symptoms as predictors of ACS in men and women. Researchers hypothesized that atypical symptoms would predict ACS in males but not females. Typical symptoms were identified as chest pain or discomfort, diaphoresis, dyspnea, and arm or shoulder pain. Fainting and dizziness were identified as atypical symptoms. The study revealed that typical symptoms were the strongest predictors of ACS in women. The study sample included 246 women and 276 men who were 45 years of age or older and reported to the hospital with complaints of symptoms suggesting ACS. Symptom presentation was documented verbatim. Researchers indicated that X^2 and t tests were done; however, statistical data were not reported. The results demonstrated that 36% women were diagnosed with ACS and 45% men received the same diagnosis. Researchers revealed that the only statistical relevant data found in a multivariate analysis was diaphoresis

(relative risk=2.53; 95% CI (1.17%-5.48%) in women and chest pain or discomfort (relative risk= 1.81; 95% CI (.95%-3.42%; p=.069). Arm or shoulder pain revealed (relative risk=1.60; 95% CI (.83%-3.10%); p=.163). Based on these findings, researchers suggest that clinicians should take women complaints very seriously.

In order to gain insight into the clinical presentation of patients with symptoms suggestive of ACS without chest pain, Coronado et al. (2004) conducted a multi-center prospective clinical trial. There were a total of 10,783 patients aged 30 years of age or older diagnosed with ACS who were eligible for inclusion in this study sample. Of the 10,783 patients 2,541 were diagnosed with ACS. The participating hospitals included 10 diversified ED throughout the United States. Data collection began in May of 1993 and continued for seven months. The objective of this study was to compare demographics, clinical features, and patient outcomes amongst ACS patients, both with and without the presence of chest pain. Analysis of the data revealed that patients with painless ACS were significantly older (71 years v 65 years, p=0.0001), women (53%, p=0.007), and or diagnosed with diabetes (35%, p=0.1). Ninety five percent of the patients with ACS had a chief complaint of chest pain and 72% of patients with painless ischemia complained of dyspnea. Further analysis of data revealed that painless ACS increased with age. Univariate analysis of clinical features associated with painless ACS were age (OR=1.5; 95% CI (1.37%-1.7%); p=0.0001), heart failure (OR=4.6, 95% CI (3.3%-6.6%; p=.0001), diabetes (OR=1.5; 95% CI (1.0%-2.0%; p=.03), female gender (OR=1.5; 95 % CI (1.1%-2.1%); p=.008), hypertension (OR=1.1; 95% CI (0.8%-1.6%; p=.5), and prior infarction (OR=1.4, 95% CI (1.0%-2.0%); p=0.4). Multivariate logistic regression revealed the following: age (OR=1.6, 95% CI (1.4%-4.7%, p=0.0001) and heart failure (OR=5.1, 95% CI=5.4%-473%, p=.00006). The study concluded that age and heart failure were

independently associated with ACS and that patients with a history of diabetes mellitus were highly likely to present free of chest pain.

In 2000, Rosengren, et al. recognized that there were clinically important gender differences in ACS clinical presentation. Research was conducted to examine gender differences in clinical presentation of younger and older patients hospitalized with a wide spectrum of ACS. A European Heart Survey of patients with ACS was conducted at academic and non-academic hospitals with and without cardiac catheterization laboratories or cardiac surgery facilities. The study was conducted from September 2000 and May 2001, a total of 14,271 patients from 25 different countries with suspected ACS were screened for potential study participation. Only 10,253 patients with diagnoses of AMI or unstable angina were eligible for study participation. A logistic regression stratified for age revealed that the female gender was a significant negative determinant of presenting with ST elevation in patients less than 65 years of age (OR 0.68 [0.58-0.79]). No effect of gender was found in patients 65 years of age and older. Simple Pearson tests were performed to test associations between ST elevation AMI, Q wave AMI, or left main disease and age. Rosengren et al. concluded that younger women with ACS were less likely than men to present with ST elevation and more likely to be diagnosed with unstable angina. There were no differences in clinical presentation of older adults. Authors of this study suspect that pathophysiological differences were the reason for the extent of atherosclerosis found in older women when compared to younger women.

A study conducted by Pelliccia, et al. (2004) found that elderly mortality rates were linked to the increased incidence of co-morbidities, delayed hospital admissions, and extensive cardiac disease states. The study was conducted in 2001 and included 4,483 consecutive

patients admitted to the ED with possible ACS and acute chest pain. Pelliccia and colleagues found that implementation of critical pathways improved patient outcomes in the elderly. Implementation of critical pathways led to more aggressive treatment of elderly patients with symptoms suggestive of ACS. Elderly patients received detailed diagnostic evaluations and were often hospitalized for further diagnostic testing.

Using the Global Registry of Acute Coronary Events (GRACE) database, Brieger, et al. (2004), conducted a multinational prospective observation study. The objective of this study was to identify ACS clinical manifestations in patients without complaints of chest pain. Brieger, et al. concluded that patients without reports of chest pain were often misdiagnosed and under treated, unless they also complained of diaphoresis. Of the 20,881 patients included in this study, 8.4% presented without reports of chest pain; 23.8 % were not initially recognized as ACS symptoms. These patients were not treated with cardiac modalities and experienced greater mortality and morbidity rates than patients who reported typical ACS symptoms. Mortality rates were higher in those who presented with complaints of presyncope or syncope (OR=2.0; 95% CI, 1.4 to 2.9).

Clinical predictors of ACS in patients with undifferentiated chest pain suggested that indigestion should also be considered a predictive factor for ACS. This prospective study conducted by Goodacre, et al (2003) was aimed at identifying clinical features that independently predict ACS in patients reporting complaints of acute undifferentiated chest pain. Complaints of indigestion or burning pain were found in 11% of the patients. Authors explained that previous teachings associated such complaints with reflux disease. Furthermore, patients who suspected indigestion were likely to self administer medications with an over–the-counter antacid. A diagnosis of ACS was given to 7.9% (77) of the 972 patients included in

this study. Of the 77 patients, the following characteristics were recognized as independent predictors of ACS: age (OR=1.09, P<0.0001); male gender (OR=8.6, p<0.001), indigestion or burning pain (OR=3.0, p=0.034), radiating pain to the left arm (OR=2.4, p=0.013) or right arm (OR=5.7, p<0.001) and previous smoking history (OR=5.1, p<0.001) or current smoker (OR=3.7, p<0.001). This study adds to the body of research by highlighting the multiplicity of ACS presentation.

Patel, Rosengren, and Ekman (2004) conducted a review of literature to examine gender differences in ACS clinical presentations. A review of 15 studies published from 1998 to 2002 found that women present with atypical presentations. Women were found to report complaints of jaw pain, nausea, vomiting, dyspnea, indigestion, and palpitations. Studies with the focus of AMI were more likely to report atypical presentations found in women. Chest pain was the most commonly reported symptom of both genders; however, women were more likely to complain of more transient, stabbing, sharp pain. Women also experienced chest pain radiating to their right arm or shoulder and to the anterior cervical region more often than males. Dyspnea was the next most commonly reported symptom. Women reported more dyspnea and more paroxysmal nocturnal dyspnea than men. One study found that women were more likely to complain of cough than males. Females were also more likely to report complaints of gastrointestinal symptoms (nausea, vomiting, loss of appetite, indigestion, and a higher frequency of diarrhea).

Age Related Research

One study titled, *Atypical presentation of AMI in three age groups* concluded that because older age groups present atypically, nurses and physicians must take time to accurately access elderly patients with suspected symptoms of ACS. This exploratory descriptive study was

conducted at a western Canadian University affiliated with acute tertiary care centers. One hundred and fifty three charts were audited and 78 healthcare professionals were interviewed (60 nurses and 18 physicians). The purpose of this study was to compare clinical presentations of AMI in individuals 35 to 64 years of age, 65 to 74 years old , and 75 years of age and older. The study also aimed to identify criteria used by healthcare providers to assess patients who were having an AMI and identify check-in times compared to times triaged by an RN. Then, Rankin, and Fofonoff (2001) used researcher developed chart audit tools and interview questionnaires to conduct this study. Validity of the tools was established by an extensive literature review and two cardiovascular clinicians. Typical ACS presentation was recognized as symptoms of chest pain/discomfort/heaviness/pressure. Atypical symptoms were indigestion, epigastric or abdominal pain, dyspnea, nausea, emesis, jaw or back pain, and generalized sensation of infirmity. Analysis of data revealed 43% of men 75 years of age and older presented with atypical symptoms (p=.002) compared to 40% of women 65-74 years of age. Then et al. concluded that as the age of men increased, they were more likely to display atypical presentations. Conclusively, these researchers suggested that education should be provided to enhance recognition of other clinical characteristics besides the typical ACS presentation.

Between the period of January 1990 and July 1995, Culic et al. (2002) conducted a study to examine the symptomatology of AMI onset based on age, gender, and risk factors. Elderly patients were least likely to complain of any pain (OR=0.64; 95% CI=0.47-0.88), chest pain (OR=0.69. 95% CI=0.58-0.98), left arm pain (OR=0.69, 95% CI =0.56-0.84), right arm pain (OR=0.80, 95% CI=0.63), right shoulder pain (OR=0.80, 95% CI=0.65-0.99) or only non-chest pain (OR 0.56 95% CI=0.35-0.89). The elderly were also more likely to report dyspnea (OR=

1.31, 95% CI=1.08-1.60) and syncope (OR 1.63, 95% CI 1.06-2.50). Diverse presentations were found in patients at risk for ACS. Patients with a smoking history were more likely to report weakness, emesis, and least likely to report diaphoresis, dyspnea, or syncope. Hypertensive patients were likely to report symptoms of chest, left arm and shoulder pain. The clinical significance of this research allowed society to recognize atypical presentations in high risk patients. High risk patients were those who were least likely to report to an ED for atypical symptoms of ACS. Culic et al. concluded that several factors impact AMI clinical presentation including age, smoking history, hypertension, diabetes, and hyperlipidemia. This information serves as a pertinent reminder for Nurses to inquire about co-morbidities and past medical history during triage assessment.

Perers, et al. (2003) sought to ascertain gender differences related to age and type of ACS. The study included 1,744 patients who presented to the ED between 15 September 1995 and 15 September 1999. Individuals in this study were all diagnosed with unstable angina or an AMI. Analysis of the data revealed that older women were more likely to present to the ED with an ST elevation AMI when compared to the male gender. Perers et al. concluded that the elderly patients were least likely to seek treatment and more likely to have a pathologic ECG. Older adults were more likely to have hemodynamic instability. Such research is important for utilization as an education tool for the elderly patients who are least likely to report to the ED for treatment.

Decision Making Processes

Arslanian-Engoren (2004), conducted a prospective study using a total of 108 triage nursing decisions. Thirteen nurses were involved with this study. Nurses were recruited from two Midwestern urban university affiliated hospitals. The nurses selected for participation

were actively employed Registered Nurses (RN) who triaged adults with symptoms suggestive of ACS and were willing to complete a questionnaire. The aim of this study was to ascertain whether or not nurse's initial triage decisions could predict ACS. The researcher hypothesized that if nurses are able to identify early ACS symptoms, they may be able to recognize an actual cardiac event and aggressively initiate appropriate interventional strategies. During the study, nurses were asked about their initial inference relative to patient clinical presentation and the likelihood of symptom presentation to be considered cardiac, respiratory, gastrointestinal, or of another nature. Responses were rated using a visual analog scale of zero to four. The findings of this study were poor. A sensitivity of 57%, specificity of 59%, predictive value of 685, and a negative predictive value of 56% was noted. Forty-four percent of the ACS diagnoses were missed by triage nurses. Logistics regression identified four significant ACS predictors. Past diagnosis of myocardial infarction with a 95% CI (1.98%-41.67%) p=.005, past medical history of coronary heart disease 95% CI (1.32%-18.52%), p=.018, chest pain 95% CI (2.36%-19.61%) p=000, and smoking history 95% CI (2.36%-19.61%), p=.029. The author concluded that nurses were able to identify symptoms suggestive of ACS upon initial triage assessment; however, when compared to the physician's admitting diagnosis, nurses failed to recognize ACS in 42% of patients.

Using four focus groups, a non-experimental descriptive study conducted by Arslanian-Engoren, (2000) examined gender and age bias in triage decisions utilizing two urban and two suburban Ohio EDs. Twelve RNs with an ED background and triage experience participated in the study. The objective of this study was to examine ED triage nurses' decisions for patients presenting with symptoms suggestive of ACS. The implied research question was: do ED nurses render different triage decisions based on gender or age? Analysis of the data revealed

that triage nurses based decisions on patient cues. Elderly people with cardiac issues required immediate medical attention. Findings found to impact emergency nurses triage decision making when dealing with patients with ACS symptoms were: practice environment, patient presentation, nursing experience and knowledge, fear of liability, and gender specific behaviors. When patients stated, "I'm going to die", "I am having a heart attack", or "I have chest pain", such comments raised a red flag with nurses. Nurses reported that an MI is not one of the first diagnoses given to middle aged women. Conclusively, the nurses admitted to holding different perspectives regarding the likelihood of ACS in men and women.

To examine nurses' decisions while triaging patients of different genders, Arslanian-Engoren (2001) conducted a mailed survey of 500 randomly selected ED nurses. The goal of this study was to examine ED nurses' decisions when triaging patients of different genders presenting with similar symptoms or complaints. Each subject was mailed a clinical vignette and a questionnaire. Analysis of the data revealed that gender and age bias can exist and does impact the nursing triage decision making process; especially while assessing middle-aged women presenting with symptoms suggestive of ACS. Chi-square and t tests were used to evaluate triage urgency, admission status, suspected diagnosis, demographic characteristics, and to assess for cue relevancy differences in each group. Ascertaining clue relevancy in relation to prediction of triage urgency was done using a multiple regression analysis. The results of this study were as follows: the middle aged male vignette patient was perceived to require an urgent triage ($t=2.58$, $df=207$, $p=0.001$), an admission to an intensive care unit ($X^2=10.43$, $df=1$, $p=0.001$), and lastly, was more likely to be considered for a cardiac diagnosis then a female ($X^2=37.49$, $df=1$, $p<0.0001$) with a similar presentation. No disparities were found in the elderly vignette.

During a 14-week time period, an observational study was conducted by Gerdt and Bucknall (2001), in a Melbourne, Australia ED. The objectives of this study were to describe data collected by ED nurses during triage in order to prioritize care and to explore which variables impacted the triage process. Twenty six triage nurses were observed during 404 triage sessions. The data were collected using a 20 item instrument. A single observer instrument was used and contained performance frequencies of multiple decision tasks and several related variables. Significant differences were found with the observed performance of vital sign collection by the patient's triage code (X^2=62.6, p=0.00). Nurses were likely to collect more vital signs on patients with higher levels of acuity. Findings of this study suggested that subjective factors strongly influence the triage process. A univariate analysis of variables that impacted triage duration revealed the following: interruptions (ss=11.72, df=1, f=5.69, p=0.02), patients with letters of referral (ss=25.16, df=1, f=12.23, p=0.00) first aid (ss=12.01,df=q, f=5.84, p=0.02), nurses (ss=162.67, df=25, f=3.16, p=0.00) vital signs when patients did not have an injury (ss=29.6, df=2, f=7.11, p=0.00) and language barriers when patients did not speak English (ss=10.94, df=1, f=5.32, p=0.02). In this study, physiological data were rarely used by nurses when deciding patient triage acuity. Conclusively, this study found strong implications for developing triage standards and providing triage education; nurse individuality influenced triage duration considerably.

A study by Christenson, et al. (2004), hypothesized that less than 2% of patients with ACS would be discharged from the ED without healthcare providers suspecting ACS. To test this hypothesis, a prospective observational cohort study was conducted using patients aged 25 years of age and older, presenting to the ED with complaints of chest pain during June 2000 to April 2001. The objective of this study was to determine the percentage of patients with ACS

who were inappropriately discharged from the ED and to estimate the number of patients who are admitted unnecessarily. This study was conducted at urban cardiac centers in Canada. A sample size of 1,819 patients was used. At the 30 day mark of this study, patients were assigned a predefined explicit discharge diagnosis of definite ACS or non-ACS. The study found that 5.3% of ACS cases were missed and 37% of the patients who did not have ACS were admitted to the hospital. A clinical sensitivity for detecting ACS of 94.7% was noted with a 95% CI (71.5%-76.0%) and a specificity of 73.8% with a 95% CI (71.5%-76%). Other findings of this study include: 71% of patients were held in the ED for more than three hours, 13.2% were assigned a diagnosis of acute myocardial infarction, and 8.6% were diagnosed with unstable angina. These findings suggest that in order for patients with ACS to be safely discharged, clinical tools are necessary for clinicians to properly identify ACS symptoms. Researchers believed that opportunities to improve safety and efficiency of ACS assessments exist.

One study conducted by Pope, Aufderheide, and Ruthazer, et al. (2000) aimed to ascertain the incidence of missed ACS diagnosis, find related factors to inadvertent discharges, and to analyze clinical outcomes of the patients who were discharged to home. A multi-center prospective clinical trial was conducted including 10 EDs throughout the United States. The sample population included 10,689 patients 30 years of age and older who presented to the ED with complaints of chest, jaw, or epigastric pain or discomfort, shortness of breath, dizziness, palpitations, syncope, or other symptoms suggestive of ACS. This study found that of the 10,689 patients, only 889 (17%) were eligible for participation (8% had an acute myocardial infarction and 9% were diagnosed with unstable angina). Multivariate analysis revealed patients were less likely to be hospitalized if they were women younger than 55 years of age

(OR 6.7; 95% CI (1.4-32.5%), non-Caucasian (OR 2.7; 95% CI (1.1%-4.3%), complained of shortness of breath (OR 2.7; 95% CI (1.1%-4.3%) or had a normal ECG (OR 3.3; 95% CI (1.7%-6.3%). Patients were not hospitalized based on ethnicity, gender, or the absence of typical ACS presentation. It was concluded that although only 4.4% of patients with symptoms suggestive of ACS were inadvertently dispositioned to home; discharge of such patients can easily be related to increases in morbidity and mortality rates.

Researchers in Sweden raised concerns about poor utilization of hospital resources as evidenced by over-admissions for patients presenting with ACS symptoms. An observational study was conducted by Ekelund, Nilsson, Frigyesi, and Torfvit (2002) to analyze current characteristics, disposition, and outcomes of patients with suspected ACS. The study was conducted at Lund University ED which treats an estimated 50 people each day. In 2000, 157 consecutive patients reporting to the ED with symptoms compatible to ACS were included in this study. Each patient complained of chest pain or discomfort, dyspnea (without obvious pulmonary disease or acute heart failure), arrhythmia of possible ischemic origin, or suspected cardiac syncope. Analysis of data revealed that 47% of the patients treated by the ED were admitted to the hospital for ACS. After a thorough follow-up evaluation during their hospital admission, only 26% of these patients were discharged from the hospital with a final discharge diagnosis of ACS. Because almost half of the patients treated at this ED with suspected ACS were hospitalized and later only a percentage were found to have “true” ACS diagnoses, Ekelund et al. concluded that there is a great potential for diagnostic improvement in EDs. Ekelund et al. also recognized a moderate amount of unnecessary hospital admissions which supports the potential of developing a specialized chest pain unit.

Utilization of nurses specialized in cardiac care has proven helpful with enhancement of patient outcomes those with symptoms suggestive of ACS. Kucia, Taylor, and Horowitz (2001), conducted a prospective randomized controlled pilot study and found that the presence of coronary trained nurses in EDs are beneficial for patient outcomes. Research was conducted at the ED of a metropolitan public teaching hospital in South Australia. The goal of this study was to examine the impact of trained coronary care nurses on transfer times from the ED to a coronary care unit in patients with ACS. The sample included 893 patients who presented with complaints of chest pain. Subjects were coronary nurses with a baccalaureate degree in nursing or a graduate degree in critical care who were experienced in interpreting ECGs and managing patients with ACS in critical care units. Working very closely with ED nurses, the coronary nurse was required to immediately assess patients with complaints of chest pain and record and interpret a 12 lead ECG. Analysis of the data revealed that the presence of a coronary trained nurse slightly increased the numbers of patients triaged. The coronary nurse averaged 0.4 patients an hour versus the ED nurse, averaging 0.6. Ten percent of the patients were admitted to critical care units by the coronary nurse, averaging 102 minutes from assessment time to transfer time; in the absence of the coronary nurse transfer times averaged 117 minutes. The study also found an increase in intervention occurrence. In the presence of a coronary nurse, patients were administered thrombolytics in an average of 33 minutes, as opposed to 53 minutes without the presence of a coronary nurse. The statistical results of this study were as follows (using 95% CI): average transfer times (70-134%) and (95-139%) with and without a coronary nurse present respectively; time of thrombolytic therapy administration for ACS patients, (10-55%) and (25-82%). Despite the fact that there was a noted trend of improvement, researchers did not

find the data to be statistically significant. The study concluded that while the presence of coronary trained nurses in the ED are shown to be beneficial for patient outcomes, cost benefit implications exist. Further research utilizing larger controlled studies and an analysis of the cost-benefit analysis was recommended by the researchers.

Moriel, Behar, and Tzivoni, et al. (2005) conducted prospective observational surveys of 1,331 elderly (70 plus years of age) patients with ACS to evaluate gender differences and patient outcomes. Elderly patients with ACS admitted to cardiology departments or intensive cardiac care units were included in this study. Moriel, et al. concluded that although men and women received similar treatment modalities during their hospitalization, higher mortality rates were found in women. Mortality rates were evaluated at seven day and six month intervals. Higher mortality rates were found in women within a seven day time frame; particularly those who were denied coronary angiography. Crude and covariate adjusted mortality rates were higher in women (12% compared to 7%; p=.007l adjusted OR, 1.83; 95% CI). Higher mortality rates were also found in patients with ST elevated ACS in both early and late phases.

Kaleta, Muellller, and Neils (2002) recognized the importance of immediately recognizing ACS symptoms and decreasing delays in treatment times. Using the National Registry of AMI, a randomized chart review was conducted to determine modalities which could increase patient treatment times. The main area of focus was to decrease “initial presentation-to-EKG times”. After implementation of an algorithm “initial presentation-to- EKG times” decreased from 28 minutes to 11 minutes (p=<0.005).

Theoretical Framework

Neuman's system theory guided the research process for this study. Originally designed in 1970 with intentions for utilization as a teaching aid, this theory has evolved over time and is used in multiple facets of nursing. Neuman's theory has been utilized in nursing administration, multiple arenas of academia, discharge planning, community health, mental health, as well as health promotion. The systems theory is in accordance with perspectives of nationwide and global healthcare organizations such as American Nursing Association and the World Health Organization respectively (Neuman, 1989).

As illustrated below (figure 1), the systems theory represents a multidimensional perspective of each individual patients-system. Each system is complex and dealt with as a whole. Within each complex system, the complexity is broken down and explained with multiple concepts. The concepts recognized within each system include but are not limited to: flexible lines of defense, normal lines of defense, lines of resistance, environment, prevention, stressors, and five variables (physiologic, psychological, spiritual, developmental, and socio-cultural). Neuman also recognized the importance of nursing roles while interacting with each patient (Neuman, 1989).

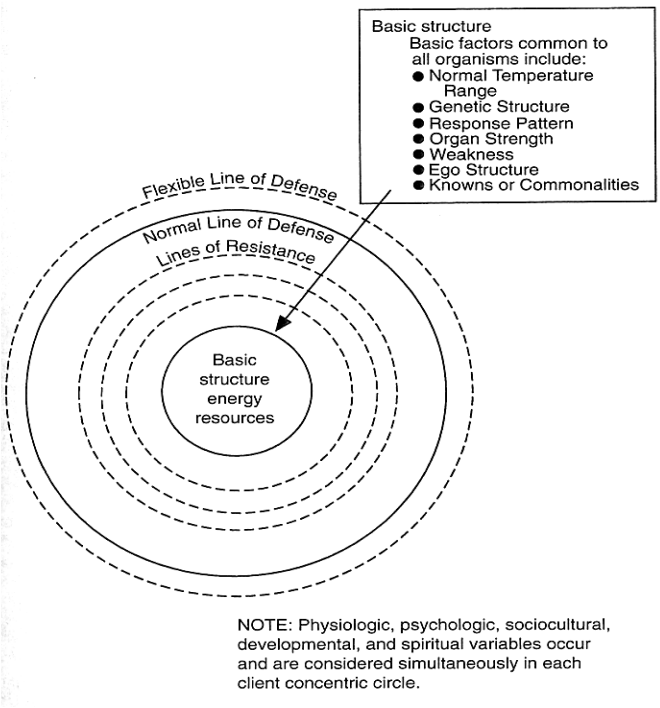

Figure 1. Neuman's System Theory (Newman, 1989)

The following concepts were utilized to guide this research study: patient, physiology, lines of defense, environment, lines of resistance, and the nurse-patient relationship.

Patient

Neuman viewed the patient as a complex system. A pictorial of the patient system is represented by concentric circles serving as a protective barrier to the patient's basic structure. The basic structure of each patient includes genetic structure, response pattern, and organ strength (Neuman, 1989). According to Neuman, the nurse views each patient as someone that is dealing with stress. During this research process the recognized *stress* is ACS. Theoretically, because each patient is an individual system they presented with their own individual reports of ACS symptoms.

Physiology

According to Neuman (1989), the patient's response to stressors is determined by resistance shown with their physiologic states. The systems theory discusses five variables (physiological, psychological, socio-cultural, developmental, and spiritual) contained within each patient. For purposes of this research the patient's physiologic state was studied. The physiologic state referred to the bodily structure and its' function (Neuman). During an episode of ACS, the physiologic response of an elderly patient may include jaw, neck, or shoulder pain, shortness of breath, hypotension, syncope, arrhythmia, and/or restlessness. Younger individuals may have more typical symptoms to include chest pain, nausea, diaphoresis, and dyspnea (Lueckenotte, 1996).

Lines of Defense

The basic core of each patient is protected by lines of defense. A diagram of the systems theory depicts a solid circle, representing the normal lines of defense, which serves to protect the patient's basic structure. The flexible line of defense is represented by an outer "broken" circle surrounding the normal lines of defense. This flexible line serves as a buffer, keeping the system free of symptomatology and serving as a protective barrier to the normal lines of defense. The normal line of defense protects the patient's basic core and maintains system integrity (Neuman, 1989). Theoretically, ACS first penetrates the flexible line of defense and later penetrates the normal line of defense which is typically when patients begin to report symptoms.

Environment

According to Neuman (1989), the environment is recognized as internal, external, or created factors surrounding each patient. The internal environment included those factors which were contained solely within the patients. External environmental factors included those forces that existed outside of the patients system. The created environment, although unconsciously developed by the patient, is purposeful in its' response to stressors. The created environment can alter a patient's physiologic response to stressors (Neuman). For purposes of this research, the environment for ACS included high life stress encounters, poor dietary habits, sedentary lifestyles, and AHA (2005) risk factors.

Lines of resistance

As a protective measure, lines of resistance are activated when normal lines of defense are invaded by environmental stressors. Lines of resistance serve to protect the patient system integrity (Neuman, 1989). When encountered by stressors, if utilized effectively, the patient's system can recover. Ineffective usage of the lines of resistance can result in death of the patient system. For research purposes, the lines of resistance were observed with physiologic changes noted with clinical presentation of ACS.

Nurse-patient relationship

Neuman (1989) recognized that the main purpose of nursing is to keep the patient system stable through a holistic approach. By means of accurate assessment and awareness of potential stressors, Nurses should be able to assist the patients to optimal levels of wellness. Keeping this thought in mind, during the triage process nurses should take a holistic approach to nursing and consider all risk factors of ACS as recognized by the AHA (2005). Such risk factors

include smoking, hyperlipidemia, diabetes mellitus, hypertensions, physical inactivity, metabolic syndrome, and overweight/obesity.

Summary

Based on the review of literature, various findings suggested further research in multiple areas respective to the clinical presentations of ACS. It is clear that further research is needed to evaluate age and its' relationship to clinical presentation of ACS. With the increase of women diagnosed with ACS, a moderate amount of research was conducted to ascertain gender differences in ACS clinical presentation. Research consistently reported gender differences in ACS presentation, finding that women with diabetes have the most atypical presentation. Researchers continually recommended further gender based studies due to the many peculiarities found with ACS presentation in women.

Then, Rankin, and Fofonoff, (2001) recognized the existence of ambiguities in literature regarding ACS clinical presentation and its' relationship to age. Other studies revealed disparities in care with regard to age; some healthcare providers favored the young while others favored older patients. Since both age and gender has been shown to effect ACS clinical presentation, Battler et. al. (2004) suggested conducting age-specific gender differences research. Previous studies have recognized increased mortality rates associated with ACS in the elderly population.

The aforementioned studies have demonstrated the importance of nurse's recognition of the varied clinical presentation of ACS while triaging. Further research can assist nurses to accurately identify patients with ACS signs and symptoms resulting in decreased waiting times in the ED, immediate initiation of appropriate life saving measures, and reduction of premature morbidity and mortality associated with ACS. Early recognition of ACS aids with prediction

of patients disposition and allows nurses to better anticipate patients needs, expedite further diagnostic procedures (i.e. chest x-ray, blood collection, electrocardiogram, etc.) or prepare the patients for transport to another medical facility. With further research, there is a potential that nursing triage algorithms can be produced to ensure immediate implementation of life saving measures in all patients presenting with symptoms suggestive of ACS.

This study is therefore justified to further examine clinical presentation of ACS and its' relationship to age. With the elderly population increasing at exponential rates, this study will provide important data related to age and symptom presentation associated with ACS.

The next chapter includes the methodology of this research. The research design, setting, population, ethical considerations, and data analysis will be discussed further.

III. METHODS

The purpose of this study was to identify ACS clinical presentation differences found in the elderly and younger patient populations. This chapter describes in detail the research design, setting, population, ethical considerations, and data analysis used to achieve the purpose of this study.

Design

A retrospective chart review was conducted in order to ascertain differences of ACS clinical manifestations in the elderly when compared to younger patients. A review of charts retrospectively allowed for examination of ACS cases that presented to this military facility from January to December 2005. Review of charts retrospectively allowed the researcher to examine all ACS cases presented within the specified time frame. This design was best because it allowed the researcher optimal comparison of ACS symptoms of the elderly compared to younger Americans.

Setting

The study was conducted at a military hospital in the Midwestern region. The hospital is a 60 plus-bed facility with a level two ED. This level two ED treats an estimated of 80 patients daily with an average triage acuity level of four. Triage acuities range from one to five. Patients triaged at a level five require minimal emergent care (e.g. complaints of medication refills or flu like symptoms). Level one is indicative of a patient requiring immediate emergency attention (e.g. cardiac arrest) (Emergency Nurses Association, 2001). Annually, an estimated 24,000 patients are treated at this facility's ED.

Population

The target population for this study included patients who reported to the hospital with ACS symptoms. The accessible population was those individuals who were 38 to 87 years of age presenting to this military facility from January to December 2005 with symptoms suggestive of ACS. The inclusion criteria were individuals treated at the hospital and diagnosed with ICD-9 codes 410-411.1 which included diagnosis of intermediate coronary syndrome or an acute myocardial infarction. Individuals diagnosed with post myocardial infarction syndrome (ICD-9 code 411.0) (Appendix A) were excluded from this research study. In order to capture individuals who were actively infarcting, post myocardial infarction syndrome was excluded from the sample.

Sampling Plan

A convenience sample of 106 records was used for this study. Selection of this convenience sample allowed the researcher to choose individuals 38-87 years of age and older, treated at this military facility and diagnosed with an ICD-9 code 410.1-411.1. ICD-9 codes 410-411.1 and its' subsets (Appendix A) encompass ischemic heat disease, which includes: acute myocardial infarction, coronary artery (embolism, occlusion, rupture, and thrombosis) and unstable angina. Post-myocardial infarction syndrome is addressed by ICD-9 code 411.10 (Hart, Hopkins, & Ford, 2006). In order to capture individuals who were actively infarcting, post myocardial infarction syndrome was excluded from the sample. Individuals were selected using a computerized database from the agency's biometrics department. The sample size included 85 records; 49% of this population were males 65 years of age and older.

Ethical considerations

Permission to conduct this research was obtained from the hospital and Wright State University's institutional review board (IRB) prior to data collection. Upon approval, a retrospective chart review occurred. During the retrospective chart review, risks to patients were minimal and patient identification remained anonymous (Polit & Beck, 2004). In order to maximize patient anonymity, personal identifiers were not used. All information collected was documented on a researcher developed tool (Appendix B) without the inclusion of names, social security numbers, or other protected health information. Only data pertinent to this research study were collected.

Instrument

An investigator developed instrument (Appendix B) was used to collect socio-demographic data and health information related to symptoms of ACS. Identification numbers collected on the data collection tool represented each record in the order in which they were reviewed. For an example, ID#1 represents chart 1, ID#2, represents chart 2, etc. Socio-demographic information collected included age, gender, and race. Other information collected included chief complaint, presenting symptoms (as noted per triage documentation), risk factors, vital signs (blood pressure, pulse rate, respirations, and oxygen saturation), diagnostic evaluation results, and triage/physician evaluation times. Triage documentation was paraphrased in order to avoid inclusion of personal identifiers. Identification of chief complaints and presenting symptoms facilitated the understanding of physiologic differences in ACS presentations. Lastly, identifying triage times and physician treatment times facilitated the evaluation of the sense of urgency recognized by the triage nurse. The data collection instrument was validated

for content by an ED physician with two years of experience and a doctorate prepared acute care nurse practitioner with more than five years of experience.

Procedures

Upon approval by both IRBs, the research process was initiated. Printed information from a computerized database was utilized to identify medical records qualified for inclusion in this study. Records were requested from the agency's biometrics and analysis data department. The records requested included those with ICD-9 codes 410-411.1 of individuals treated at the hospital from January to December 2005. When the list of eligible participants was compiled, charts were retrieved from the agency's records room. Charts were kept in a locked file room. During data collection, charts remained in the locked file room at all times. Charts were reviewed individually and thoroughly scrutinized to retrieve necessary data. Data collection included socio-demographic information to include age, gender, and race. Other data collected included physiologic information (vital signs), physician orders, nurse's notes, and results of diagnostic evaluations. Information was collected and annotated on the researcher developed data collection form (Appendix B). Data were entered into a data collection spreadsheet for analysis. Data analysis was completed by the Statistical Consulting Center Wright State University. An independent *t*-test for differences in group means was done to determine if there was a difference in the mean pain rating on admission experienced by younger and older participants (2-tailed). Levine's Test for Equality of Variances was not significant (F=.16; p = .69) indicating that there was no significant difference in the variation of the samples. Chi square analysis was also conducted to determine if there

were differences in the proportion of older and younger subjects experiencing specific symptoms (Munro, 2000).

Theoretical Framework

This study was supported by Neuman's system theory. The systems theory represented a multidimensional perspective of each individual patient-system. This study sought to identify reported clinical symptoms of each patient during an episode of ACS during his/her initial contact with a healthcare professional. Neuman's model assisted this researcher with recognition of the complexity within each individual patient and examination of each chart from a multidimensional perspective. Throughout the investigative procedure, participant records were viewed individually with strict attention paid to clinical manifestations. This researcher will provide two cases of relevant usage of Neuman's theory.

During this research process, the following Neuman's concepts were utilized: patient, physiology, lines of defense, environment, and lines of resistance.

Patient

According to Neuman, the nurse views each patient as someone who is dealing with stress. For purposes of this research study, the recognized *stress* was ACS. A pictorial (figure 1) of the complex patient system is represented by concentric circles serving as a protective barrier to the patient's basic structure. The basic structure of each patient includes genetic structure, response pattern, and organ strength (Neuman, 1989). This would explain the variation of ACS clinical manifestations. Theoretically, because each patient is an individual system they presented with their own individual complaints of ACS symptoms.

Physiology

According to Neuman (1989), the patient's response to stressors is determined by resistance shown with his/her physiologic states. The physiologic state referred to the bodily structure and its' function (Neuman). During episodes of ACS, the physiologic responses found were chest pressure, dyspnea on exertion (DOE), neck pain, syncope, palpitations, reflux, and arm numbness.

Lines of Defense

The basic core of each patient is protected by lines of defense. A diagram of the systems theory depicts a solid circle, representing the normal lines of defense, which serves to protect the patient's basic structure. The flexible line of defense is represented by an outer "broken" circle surrounding the normal lines of defense. This flexible line serves as a buffer, keeping the system free of symptomatology and serving as a protective barrier to the normal lines of defense. The normal line of defense protects the patient's basic core and maintains system integrity (Neuman, 1989). Theoretically, ACS first penetrated the flexible line of defense and later penetrated the normal line of defense which is typically when patients reported their symptoms.

Environment

Neuman (1989) recognized that the created environment can alter a patient's physiologic response to stressors (Neuman). The environment for ACS included high life stress encounters, poor dietary habits, sedentary lifestyles, and AHA (2005) risk factors. The risk factors of this research sample included hypertension (37%), hyperlipidemia (27%), diabetes mellitus (15%) and previous cardiac history (26%).

Lines of resistance

As a protective measure, lines of resistance are activated when normal lines of defense are invaded by environmental stressors. When encountered by stressors, if utilized effectively, the patient's system can recover. As identified in case two, although the patient's normal lines of defense were invaded, after successful intervention, the system was able to recover. As demonstrated with case one, ineffective usage of the lines of resistance can result in death of the patient system. For research purposes, the lines of resistance were observed with physiologic changes noted with clinical presentation of ACS.

Case 1

A 77 year old male arrived to the ED with a chief complaint of shortness of breath. The nurse's triage annotated patient reports of dyspnea for one day and symptoms worsened prior to arrival. This patient also reported left shoulder and throbbing left chest wall pain. The pain was rated at a 7/10 on the analog scale. Vital signs were as follows: blood pressure: 116/70 mmHg; heart rate: 130 beats per minute; respirations: 24 breaths per minute; oral temperature: 96.9 ^{o}F; and an oxygen saturation of 97%. The associated symptoms were nausea and dyspnea. Chest pain was relieved with two tablets of sublingual nitroglycerin. The comorbidities included hypertension, diabetes, and history of a previous MI. Electrocardiogram (ECG) testing revealed abnormal findings of a suspected subendocardial MI. This patient went into cardiogenic shock and arrested enroute to another medical facility where further diagnostic treatment could be rendered. Unfortunately, the resuscitation efforts were unsuccessful.

Case 2

An 84 year old female reported to the ED with a chief complaint of 8/10 chest pain for three to four days. The nurse's triage note annotated patient reports of substernal chest pain radiating to the left upper extremity with pressure and tingling to left fingers accompanied with left shoulder pain. The associated symptom was shortness of breath. Vital signs were as follows: blood pressure: 218/92mm Hg; heart rate: 81 beats per minute; respirations: 18 breaths per minute; oral temperature: 97 ^{o}F; and an oxygen saturation of 96%. The cormorbidities included a previous MI in 1981 and hypertension. The ECG revealed an acute septal MI. This patient was successfully transferred to another medical facility for further diagnostic evaluation.

Summary

The retrospective chart review was designed to examine clinical manifestations of ACS as individuals presented to the hospital for an ED visit or an appointment with their primary care provider. The setting, a military medical facility, was described as well as the study population and sampling plan. An outline of the data analysis plan was also provided.

IV. ANALYSIS OF DATA

The purpose of this study was to identify ACS clinical presentation differences between the elderly and younger adults. This study attempted to answer four questions. The research questions were as follows: 1) When compared to younger patients, how does ACS clinical presentation differ in the *elderly* patient?; 2) Is age related to clinical *presenting symptoms* of ACS?; 3) What are the most common clinical presentations of elderly patient s with symptoms of *ACS*?; and 4) How much time elapses between triage and physician assessment? The answers to these research questions are discussed within this chapter. The sample characteristics and analysis of data are also presented.

S*ample*

The initial sample consisted of 106 medical records. These106 medical records included individuals treated at the medical facility who were diagnosed with ICD-9 codes 410-411.1 as a primary, secondary, or tertiary diagnoses. Of the 106 records eligible for participation, 85 charts (80%) were available for review. Of the 21 unavailable charts, 11 were "checked out" by health care personnel, seven were not found in the computer registry system, one record was retired, and two records were duplicate entries. Subjects for this study included 35 females (41%) and 42 males (49%). Forty-nine percent of the sample was 65 years of age and older. The final sample size was 85.

Sample Characteristics

The sample included 85 individual charts of patients 38 to 87 years of age who had a discharge International Classification of Diseases, 9th revision, (ICD-9) code of 410-411.1 (excluding 411.0) during the specified time frame. There were 35 female (41%) and 42 (49%) male subjects. The gender of the other 10% of patients was not annotated. Thirty-seven

(43.5%) were younger than 65 years of age and 49.4% (42) were older than 65. Individuals aged 65 years and older averaged 73 years of age. The most common ICD-9 code was 411.1 (Intermediate Coronary Syndrome) followed by ICD-9 410.91 (MI, unspecified site). Clinical manifestations included chest pressure, dyspnea on exertion (DOE), neck pain, syncope, palpitations, reflux, and arm numbness. Comorbidities included hypertension 32 (38%), hyperlipidemia 23 (27%), diabetes mellitus 13 (15%) and previous cardiac history 19 (22%).

Results

To answer the research questions parametric and non parametric statistics were used. Nonparametric tests were useful for this study to clarify assumptions noted by the researcher and are useful for small sample research studies. Nonparametric tests included a chi-square test for independent samples were used to determine if there was a difference in chief complaint by age. Further chi square analysis of the quality of symptoms by age did not show a significant difference. Further analysis of each research question is provided below. Due to such a small sample size, the power of this study was relatively low. With regard to the relationship between age and chief complaint, statistical analysis revealed a power of .561 (Lenth, 2006).

Research Questions

1) When compared to younger patient s, how does ACS clinical presentation differ in the *elderly* patient?

As displayed in the schematic below (figure 3), younger subjects complained of chest pain and were least likely to have exertional dyspnea or cardiac concerns. Younger patients also perceived ACS episodes as acid reflux or chest colds. Elderly individuals were more likely to have exertional dyspnea, and report cardiac concerns. The elderly subjects (figure 2)

were also more likely to recognize chest discomfort as chest tightness (five elderly when compared to two younger patients) instead of sharp pain (three younger patients compared to one elderly patient). Although both populations equally recognized chest discomfort as pressure; younger subjects were three times more likely to recognize pain as sharp when compared to the elderly. The result of this analysis indicated that there is no statistically significant difference in clinical presentation based on age.

65 Years of Age (YoA) and older

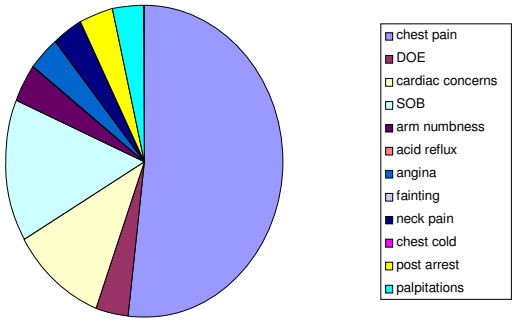

Figure 2. Complaints of patients ≥65 YoA

<65 Years of Age

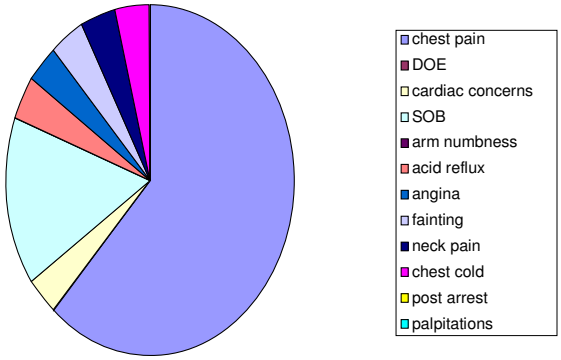

Figure 3. Complaints of patients < 65 YoA

2) **Is age related to presenting symptoms of ACS?**

In order to provide a response to this question, strict attention was paid to clinical manifestations at time of presentation. Analysis of presenting symptoms included chief complaint, pain quality, associated symptoms, and relief with nitroglycerin prior to arrival. Because there was no statistical significance in the comparison of symptoms based on age no relationship was identified.

Chief Complaint

Chest pain was the most commonly reported complaint. A chi-square test for independent samples was used to determine if there was a difference in chief complaint by age. The chief complaint was not different by age group (χ^2 =6.984; phi= .363; p=.727). Chief complaints are listed below.

Table 1. Chief complaints reported during initial contact with healthcare professional

Chief Complaint		*Frequency*	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	chest hurts/pain/pressure	35	41.2	64.8	64.8
	DOE	1	1.2	1.9	66.7
	cardiac concerns	8	9.4	14.8	81.5
	SOB/hemoptysis	1	1.2	1.9	83.3
	arm numbness	1	1.2	1.9	85.2
	acid reflux	2	2.4	3.7	88.9
	angina	1	1.2	1.9	90.7
	fainting	2	2.4	3.7	94.4
	neck pain	1	1.2	1.9	96.3
	chest cold	1	1.2	1.9	98.1
	post arrest	1	1.2	1.9	100.0
	Total	54	63.5	100.0	
Missing	System	31	36.5		
Total		85	100.0		

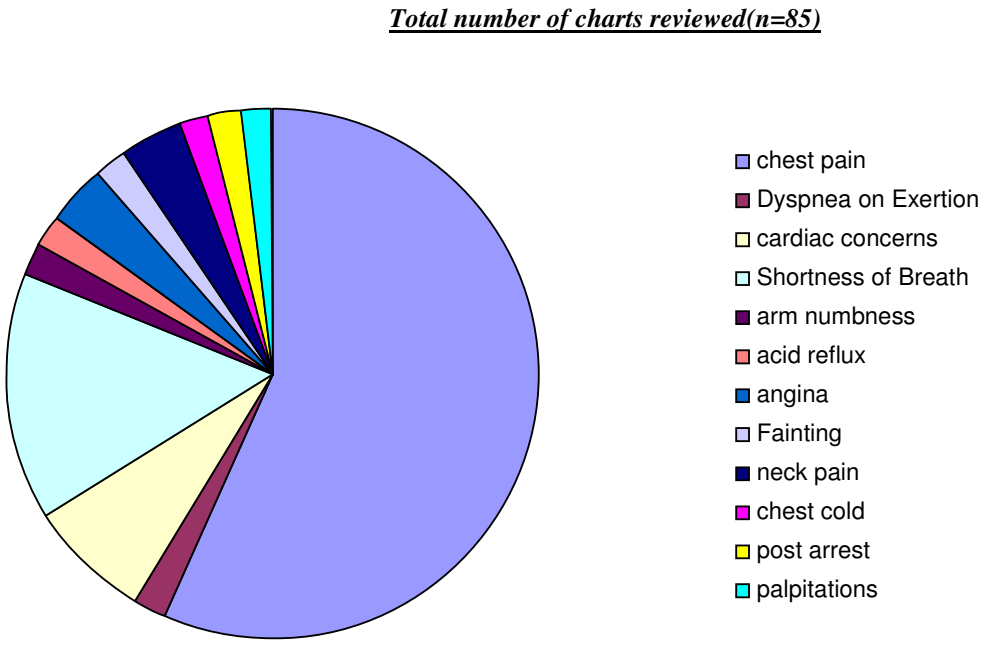

Figure 4. Schematic of Chief Complaints Reported by All Subjects

Quality of pain

An independent *t*-test for differences in group means was done to determine if there was a difference in the mean pain rating on admission experienced by younger and older participants (2-tailed) (table 2). Levine's Test for Equality of Variances was not significant (F=.16; p = .69) indicating the that there was no significant difference in the variation of the samples (Munro, 2000). Age did not impact the mean pain rating on admission to the facility age; there was no significant difference (t =.59; p = .56). Further chi square analysis of the quality of symptoms by age did not show a significant difference.

Table 2. Quality of pain described during initial contact with healthcare professional

Pain quality	≤65 years	>65 years	Total
Pressure	9	9	18
Tightness	2	5	7
Burning	2	1	3
Dull	0	1	1
Aching	2	0	2
Sharp	3	1	4
Stabbing	0	2	2
Similar to previous MI	0**	1	1

***Note: 0=No pain*

Associated symptoms

The most commonly reported symptom associated with chest wall discomfort was shortness of breath. A chi-square test of the number of associated symptoms by group showed no significant differences (χ^2 =.872; Eta=.087; p=.832). Therefore there was no association between the number of associated symptoms and age group. Table 3 depicts associated symptoms assessed during initial patient contact.

Table 3. Associated cardiac symptoms

Associated Symptom	*≤65 years*	*>65 years*	*Total*
Nausea	6	6	12
Emesis	2	2	4
Shortness of Breath	12	9	21
Diaphoresis	4	3	7

Relief from NTG prior to arrival

During the initial contact with a healthcare provider, fourteen patients (16%) reported relief from chest pain with one to three sublingual nitroglycerin tablets prior to arriving at the medical facility. Relief with sublingual nitroglycerin tablets is expected in patients with a history of angina (Lewis, Heitkemper, & Dirksen, 2000).

3) What are the most common clinical presentations of elderly patients with symptoms of ACS?

Chest pain/pressure was the most common complaint followed by shortness of breath (figure 4). Elderly patients were more likely to complain of chest tightness as opposed to younger patients who reported sharp pain. Other elderly patients voiced "cardiac concerns" or reported some atypical signs recognized by American College of Cardiology. These symptoms include arm numbness, angina, and neck pain. Palpitations were also a common complaint.

4) How much time elapses between triage and physician assessment?

The average time elapsed between triage time and assessment by a physician was 14 minutes and 0.4 seconds. Due to the variety of clinic settings (i.e. ED, primary care, or internal medicine outpatient clinics), this information was very difficult to ascertain; however, of the 18 charts with this information available, patients were seen as early as upon arrival to as late as 48 minutes after arrival within the hospital setting.

Summary

The purpose of this research study was to examine the relationship between age and ACS clinical presentation. Data analysis revealed no statistical significant relationship between clinical manifestations and the age of patients with symptoms suggestive of ACS.

V. DISCUSSION

A retrospective chart review was conducted to examine the relationship between age and ACS clinical presentation. This chapter summarizes the research process, provides implications for nursing practice, nursing education, and social policy. Future recommendations for nursing research are also found within this chapter.

Conclusions for This Study

Although a data analysis of this research does not yield statically significant results, there may be clinical relevance. Although statistical significance was not noted, the most common chief complaint without regard to age was chest pain (42.6%). These data are similar to findings from research conducted by Patel, Rosengren, and Ekman (2004) where 47% of the subjects reported chest pain.

When compared to younger subjects, it is of particular interest that 25% (21) of the elderly subjects also experienced dyspnea with chest discomfort while another 14% (12) reported nausea and 8% (7) reported diaphoresis as an associated symptom. Twenty-one percent (18) described their pain as "pressure" and 8% (7) qualified their pain as "tightness". Four elderly subjects denied pain at time of initial contact. Based on the findings of this research study, it is clear that further research must be conducted specifically geared toward the elderly and their clinical manifestations of ACS.

Related Literature

During the literature search, a great quantity of medical research was discovered with regard to ACS and its clinical presentation. Unfortunately, there was not a great deal of nursing research located nor was there extensive information available with regard to the

elderly and ACS. The literature review revealed several studies that were supported by this research while other studies contradicted findings of this study.

The findings of this study were different from the results of a study conducted by Gupta, Tabas, and Kohn (2002) who found that 47% of the patients did not complain of chest pain. Conversely, this research study found 42.6% of the participants reported chest pain. The results of this study were similar to the findings of Arslanian-Engoren, (2000) and Patel, Rosengren, and Ekman (2004). Arslanian-Engoren, (2000) found that ED nurses biased triage decisions based on age and gender. Such disparities have led to faster treatment of elderly patients and increased "wait-times" in younger populations. During this research process, in the ED, elderly patients with ACS symptoms were three times as likely to be triaged at a higher acuity when compared to younger populations. Patel, Rosengren, and Ekman (2004) found that chest pain was the most common complaint regardless of gender. These data are consistent with findings of this study where the number one complaint reported by the subjects was chest pain/pressure.

Study Limitations

The limitations of this study were the size of this military facility, chart availability, and use of a retrospective chart review. The facility was a small 60 bed institution, 12 of which were located in the ED. One of the major limitations was the research sample size. Results of this study cannot be generalized to the national population because the sample was from a military facility in the Midwest and is not representative of all medical facilities in this area. The other limitation noted includes the services provided by this institution. This hospital does not have a cardiac catheterization unit; therefore, many ACS patients are transferred to full-service facilities. This facility size restricts the amount of information available with regard

to observation of clinical presentations. Conducting the study using several facilities and longer time frames would provide a greater amount of subjects and serve as a greater representation of the general populace.

Twenty-one charts were not available in the computer database. The records were unavailable due to 11 being checked out by health care personnel, seven were "not found" in the computer registry system, one record was retired, and two records were duplicate entries. Seven of the unavailable charts were those of patients 65 years of age. If this information were available, additional details of ACS clinical manifestations in the elderly would be utilized for this research study.

Entries acknowledged as not found in the computer database did not annotate a location for record retrieval. It is suspected that such patients were treated at other facilities and the records were transferred. Records checked out by staff members or primary physicians were unavailable to the researcher due to records review or auditing processes. The one retired record was that of a deceased patient. Lastly, documentation provided by the biometrics department captured two patient s with ACS as duplicate entries.

The data collection process covered information over a one year time period. If the time period was expanded to include this year, a greater number of charts would be reviewed, thereby increasing the number of symptoms seen in this hospital setting.

In the past, retrospective chart reviews have revealed several disadvantages. Polit and Beck (2004) state that while conducting chart reviews, researchers are not aware of the biases or record limitations. During this research process, the disadvantages noted were: information was difficult to discern, handwritings were illegible, information provided was not very

detailed, and if standardized forms were used, applicable areas were left blank and not addressed.

Implications for Practice

Although the findings of this study were not statistically significant, the results should increase nurse's awareness that chest pain/pressure and shortness of breath are the most common complaints of elderly patients that were subsequently diagnosed with ACS. This information is useful during the triage process and can broaden the critical thinking skills of ED nurses. Ultimately, these data should aid in decreasing current mortality and morbidity rates associated with ACS. As evidenced by the higher triage acuities given to older patients, it is clear that nurses have recognized that ACS symptoms in the elderly will require an extensive diagnostic process.

The public and medical personnel must be educated about the term pain. Many elderly will not admit to pain. They may report discomfort. Based on research findings, elderly were more likely to recognize chest discomfort as tightness instead of "pain". Twenty nine percent of the elderly describe chest pain as pressure or tightness.

Recommendations for Future Nursing Research

To further ascertain if differences in ACS presentation occur by age, there is a need to 1) use a larger facility with a more diversified population, 2) develop a tool to accurately capture specific information, and 3) collect data over a longer period of time.

Based on findings of this study, conducting additional research of ACS specific to the elderly is necessary. Annotating findings specific to the elderly populace will be helpful in order to best ascertain clinical manifestations most commonly found in our aging population.

Development of a universal tool based on general presentations was necessary. The tool used was specific to this Hospital's ED. Specific data were not annotated when retrieving information from the inpatient setting. As an example, the inpatient setting does not require triage acuities and are not required to use a standardized form with questions specific to ACS. Fortunately, the data collection tool did not have a negative impact on the outcome of this study.

Further research is necessary to analyze nursing roles in the process of ACS recognition. Perhaps measurement of triage to EKG times would be useful to analyze critical thinking abilities of nursing personnel. Adding a vignette also may prove helpful for future research. The vignette will allow nurses to identify symptoms at time of presentation and initiate appropriate interventions based on symptoms. This vignette will allow researchers to recognize the critical thinking process of nurses involved in patient care.

Finally, AHA (2005) predicted that if all forms of major heart disease were eradicated, life expectancy would increase by seven years. If healthcare providers are able to accurately recognize and treat symptoms of ACS, we can play pivotal roles in increasing life expectancy rates. Thus, this research was necessary in order to assist healthcare providers, particularly triage nurses, with recognition of ACS symptoms in the elderly. The information discovered during this research study will prove helpful to aid nurses in the decision making process during triage thereby decreasing myocardial damage and increase awareness of ACS symptoms in the elderly.

Appendix A

Description of ICD-9 Codes

Appendix A

Description of ICD-9 Codes

ICD-9 Code	Description
410	Acute Myocardial Infarction
410.0	Infarction of anterolateral wall
410.1	Infarction of other anterior wall: anterior wall NOS, anteroapical, anteroseptal (Infarction with contiguous portion of intraventricular septum)
410.2	Infarction of inferolateral wall
410.3	Infarction of inferoposterior wall
410.4	Infarction of other inferior wall: diaphragmatic wall NOS, inferior wall NOS (Infarction with contiguous portion of intraventricular septum)
410.5	Infarction of other lateral wall (apical-lateral, basal-lateral, high lateral, or posterolateral)
410.6	True posterior wall infarction (postetobasal or strictly posterior)
410.7	Subendocardial infarction (nontransmural infarction
410.8	Infarction of other specified sites (Atrium, papillary muscle, septum alone)
410.9	Infarction of unspecified site (AMI NOS, Coronary occlusion NOS)
411	Other acute and subacute forms of ischemic heart disease
411.1	Intermediate Coronary Syndrome (Impending infarction, preinfarction syndrome, preinfarction angina, unstable angina)

Hart, A., Hopkins, C., & Ford, B. (2005) International Classification of Diseases, 9th revision Clinical Modification (6th ed.). Practice Management Information Corporation: Los Angeles, CA.

Appendix B

Researcher Developed Instrument Data Collection Tool

Appendix B

Researcher Developed Instrument Data Collection Tool:
Clinical Presentation of ACS: Does Age Make A Difference? Implications for Emergency Nursing

ID#:_____ ICD-9 Code: _____Triage time: _____ Time seen by Physician:_____

Age:___ Race: _____ Gender: M/F Chart initiated at ( ) ED ( ) Clinic ( ) Inpatient

Vital Signs: BP:_____ HR: _____ Resp:___ Temp: (0)_____ O^2 Sat:_____ %

Triage category: 5 4 3 2 1 N/A

Paraphrased Triage Notes by ( ) RN ( ) Technician or ( ) Physician :

_____
_____
_____
_____
_____

Chief Complaint: _____Pain scale (1-10): _____ Started: _____

Time course: *( )still present ( ) better ( ) gone; lasted _____*
( ) resolved on arrival to ED ( ) constant ( ) waxing and waning
( ) intermittent episodes lasting _____
( ) worse, persistent since _____ ( ) Other _____
( ) Not addressed

Quality: *( ) Pressure ( )tightness ( )indigestion ( )burning ( )Dull ( )aching ( )sharp ( )stabbing ( )pain ( )numbness ( )like previous MI Radiation: ( )none ( ) Other_____ ( ) radiates to:_____ ( ) Not addressed*

Associated Sx: *( )nausea ( )emesis ( )SOB ( )diaphoresis ( ) Other ( ) Not addressed*

Worsened by: *( )position change ( )deep breath/turning ( )exertion ( )nothing ( ) Other_____ ( ) Not addressed*

Relieved by: *( )NTG 1 2 3 ( )sitting up ( )rest ( )antacids ( )nothing ( ) Other_____ ( ) Not addressed*

Onset during: *( )rest ( )sleep ( )light activity ( )mod-heavy exertion ( )emotional upset ( )cannot recall ( ) Other_____ ( ) Not addressed*

PMH/co-morbidities: *( )HTN ( )DM ( )HLP ( )Previous MI ( )Heart Disease*
( )Angina/Heart Failure ( ) Other_____
( ) Not addressed

Surgeries/Procedures: *( )Cardiac bypass x 1 2 3 4 ( )Cardiac Cath*
( ) Angioplasty# of stents placed: _____ ( ) Pacemaker
( ) Defibrillator ( ) Other_____ ( ) Not addressed

Social History: *( )Smoker _____ PP year ( )Illicit Drugs _____( )ETOH _____*
( ) Other_____ ( ) Not addressed

Family History: *( ) CAD: _____ ( )Other _____*
( ) Not addressed

Current Meds:

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

Diagnostic Testing Results:
EKG: _____ Troponin: _____ CK-MB:_____ LDH:_____
Stress test: _____ Cardiac Cath:_____ Cardiac Bypass: _____
Chest XR:_____

<u>Additional notes:</u>

_____
_____
_____
_____
_____
_____

Appendix C

Action of the Wright State University Institutional Review Board

Appendix C

Action of the Wright State University Institutional Review Board

RESEARCH INVOLVING HUMAN SUBJECTS

SC# 3174

ACTION OF THE WRIGHT STATE UNIVERSITY
SCREENING COMMITTEE
Assurance Number: FWA00002427

Title: 'Clinical Manifestations of Acute Coronary Syndrome: Does Age Make a Difference? Implications for Triage Nursing'

Principal Investigator: Iesiah M. Harris, P.I., Grad. Student
College of Nursing & Health
Candace Cherrington, Ph.D., Fac. Adv.
College of Nursing & Health

The Institutional Review Board Screening Committee Coordinator has approved an exemption with regard to the use of human subjects on this proposed project.

REMINDER: Federal regulations require prompt reporting to the IRB of any changes in research activity [changes in approved research during the approval period may not be initiated without IRB review (submission of an amendment), except where necessary to eliminate apparent immediate hazards to subjects] and prompt reporting of any serious or on-going problems, including unanticipated adverse reactions to biologicals, drugs, radioisotope labeled drugs or medical devices.

NOTE: This approval has been assigned an "SC" number in our system, which means the WSU Screening Committee concurs that this protocol is exempt under federal regulations.

Signed Coordinator, WSU-IRB
Approval Date: April 13, 2006
IRB Mtg. Date: May 15, 2006

Appendix D

Agency Permission for Conduction of Study

Appendix D

Agency Permission for Conduction of Study

DEPARTMENT OF THE AIR FORCE
88th MEDICAL GROUP
WRIGHT-PATTERSON AIR FORCE BASE OHIO

10 March 2006

MEMORANDUM FOR 88 MDOS/SGOPE
ATTN: CAPT IESIAH HARRIS

FROM: 88 MDSS/SGSF
Clinical Investigations
4881 Sugar Maple Drive
Wright-Patterson AFB OH 45433-5300

SUBJECT: Proposed Protocol

1. The protocol you submitted, "Clinical Presentation of ACS: Does Age Make a Difference? Implications for Emergency Nursing," was reviewed via expedited review and approved by the Institutional Review Board (IRB) of Wright-Patterson Medical Center on 23 February 2006. It was determined to be exempt and has been assigned file number FWP20060010E. It has also been reviewed by the Medical Center Deputy Commander. You may now begin your study.

2. Progress reports will be due annually. You will receive a reminder 45 days in advance when your report is due. If you complete your study prior to February 2007 a final report may be completed.

3. Any changes to the study must be submitted to the Clinical Investigations office for approval prior to initiation.

4. Any unanticipated major adverse reactions or other medical misadventures must be reported immediately to the department chairperson, the Chief of Medical Staff, the Clinical Investigations Coordinator, and ultimately the commander IAW AFI 40-402. Such events will also need to be summarized in the subsequent progress report.

5. If you anticipate separating from the Air Force or changing assignments before the protocol is completed, you must notify the Clinical Investigations Office as soon as this is known. You will be required to either formally close the protocol, or to have another investigator take over the study. The latter process requires nomination by the flight commander, submission of a curriculum vitae, and approval by the Institutional Review Board.

6. Please indorse below and return to Clinical Investigations. I hope that your study will prove to be a worthwhile experience for you. Let us know if there is any way we can assist you.

DEBBIE BACHMAN
Clinical Investigations Coordinator

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