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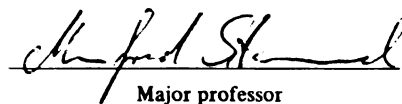
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**CHEST PAIN QUALITY DESCRIPTION AS A
PREDICTOR OF ACUTE MYOCARDIAL ISCHEMIA:
IS THERE A GENDER DIFFERENCE?**

By

Barbara Clare H. Jaquith

A THESIS

**Submitted to
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ABSTRACT
**CHEST PAIN QUALITY DESCRIPTION AS A
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By

Barbara Clare H. Jaquith

Chest pain is a deciding factor leading patients with cardiac-type symptoms to seek health care. Subjective description of chest pain quality may be the first definitive information the health care provider has with which to assess patients initially, and base clinical decisions regarding the risk for acute myocardial ischemia.

A retrospective chart review of emergent care investigated three gender-based research questions: 1. are there differences in how women and men describe chest pain quality; 2. do these descriptions predict hospital admission; and 3. are descriptive adjectives diagnostically accurate predictors of elevated serum creatine kinase-MB results, and indicative of myocardial ischemia.

Results indicated a significant difference in chest pain quality description by women and men. This difference may cue the possibility of admission, but not the probability of elevated initial CKMB results indicative of cardiac disease severity. Advanced nursing practice implications related to assessment and clinical decision-making in the primary care setting are discussed.

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1995

With love to my husband Stephen,
and to my children Anne, and Johnathan.

"God rarely allows a soul to see how great a blessing he is."

-Oswald Chambers

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INTRODUCTION

Chest pain, as a manifestation of coronary heart disease (CHD), is often the deciding factor causing patients to seek care for cardiac health problems (Schroeder, Lamb & Hu, 1978). Patients who seek professional help usually come to the primary care provider, or the hospital Emergency Department (ED). A patient's description of the quality of their chest pain may be the first definitive information the health care provider has on which to base triage decisions.

Epstein (1990) explores the creation of clinical prediction rules as a way of guiding usage of diagnostic tests to improve patient care. The challenge of improving diagnostic accuracy in the present era of increasing use of high technology may fall to the primary care provider, be they the physician, the Advanced Practice Nurse (APN), or the staff nurse involved in patient assessment and triage. The role of the health care provider requires accurate and timely assessment of initial patient complaints on presentation to the clinic or ED, and makes necessary the early recognition of patients at high risk for AMI. This allows speedy access to appropriate pharmacological (thrombolytic) or mechanical (surgical) treatments that can aid in preservation or salvage of cardiac muscle.

Evaluation of chest pain is complicated by the lack of universally occurring historic, clinical, and laboratory results indicative of acute myocardial ischemia (AMI) (Hedges, Rouan, Toltzis, Goldstein-Wayne, & Stein, 1987). While those with acute chest pain tend to have certain characteristics that are more common in people with infarction- male gender, increased age, smoking history, hypertension, obesity, diabetes- none are sufficiently discriminatory to be useful for diagnosis.

Nurses often are confronted with medical emergencies such as chest pain, which requires immediate attention. This recognition component of assessment (chest pain quality) has

increased dramatically over the last two decades. Nurses are required to make graded qualitative distinctions, and initiate care based on clinical decision-making, many times before objective diagnostic results may be available.

Benner (1984) addressed these issues involving nursing and clinical decision making in her studies of how nurses achieve excellence and power in clinical practice through the application of the Dreyfus model of skill acquisition. She recognized that there are differences between practical knowledge/skills- "know how", and theoretical knowledge- "know that". Benner believed that theoretical knowledge is embedded in nursing practice in the form of clinical knowledge accrued over time. The establishment of interactional relationships between events and practical knowledge shapes questions for theory development and enhances predictability for similar events.

Benner gathered that a nurse develops expertise when she/he tests and refines propositions and hypotheses in actual practice situations through challenges to preconceived notions. Experience is a prerequisite for expertise in nursing practice, and is reflective of differing expositional and problem solving techniques between novice and expert nurses, requiring the use of past situations as paradigms. As nurses compare their assessments in actual situations, such as caring for a patient with chest pain, graded qualitative distinctions can emerge from expert nursing practice and be shared as clinical judgment or decision making.

Benner realized that nurses are faced with two conflicting mandates: to individualize patient care, and to minimize errors through use of standards of patient care. The intent of this research is to strengthen assessment and history-taking as a tool used in triage and clinical decision-making for patients presenting with chest pain. Knowledge in expert nursing practice transcends norms and standardization. Searching for clinical relationships between history and definitive laboratory values may fill gaps in knowledge related to assessment skills for those in primary and emergency care, and will strengthen nursings' role as a communicator and diagnostician.

Research Problem Statement

CHD strikes men more frequently, beginning in the middle years, and is usually perceived by the public as a male disease. Despite its greater prevalence among men, coronary heart disease is also a major threat to women's health, and accounts for 250,000 deaths in women of all ages in the United States each year. The incidence among women has risen steadily since 1950, while it has declined among men in the same period (Ayanian & Epstein, 1991; Eysmann & Douglas, 1992). For women, the death rate from CHD is three times higher than from breast and lung cancer combined.

The proposed study evaluates three research questions. These questions are based on two of the three diagnostic criteria for MI from the World Health Organization (WHO, 1959), i.e., clinical history, and elevated cardiac enzyme levels. The third criterion, diagnostic electrocardiography (ECG) changes, will not be used in the present study. Gibler et al. (1990) noted that diagnostic 12-lead ECG changes are absent in up to 50% of the patients presenting to the ED with AMI. New techniques using 18-lead ECGs show improved diagnostic capabilities, but this procedure is not yet standard practice at the study site.

The first question is addressed to the possibility of systematic differences in how women and men describe their primary symptom of chest pain on presentation to the ED. Bickell et al. (1992) suggest that "perhaps men and women perceive and express symptoms (of chest pain) differently; ...or that physicians hear and interpret these expressions differently" (p. 796). The seriousness with which women view the symptoms of angina, and the language they use to describe their symptoms, may well influence the care they receive. Perhaps women use a vocabulary different from that of men to describe similar types of perceived chest pain, reflecting differences in life experiences, socialization, or actual experiences of pain. An example is a man who may use terms as "crushing," or "kicked in the chest" to describe chest pain, whereas a woman may be less likely to use these terms, or to use others in describing similar pain.

The second question asks whether womens' and mens' descriptions of chest pain quality predict hospital admission to a critical care area and, if so, do the same words predict admission

for women and for men? Correlations between adjectives employed by patients and decisions to admit could indicate that physicians stratify patients into high-risk (requiring hospitalization), or low-risk (safe to discharge), in part, based on their verbalizations.

The third question analyzes whether certain descriptive adjectives used by women or men to describe chest pain qualities are diagnostically accurate predictors of individually elevated serum creatine kinase-MB (CKMB) results, and therefore indicative of AMI. Evidence of such correlations may be gender specific, and may increase diagnostic accuracy, aiding in risk stratification regarding choice of treatment, and need for hospital admission (Plotnick & Fisher, 1985). Compilation of a list of "high-risk" adjectives could lead to training of physicians and nurses in the identification of high-risk patients during initial assessments, and lead to more timely and efficient care for potential cardiac patients. This researcher recognizes that the descriptive adjectives used to predict admission may not be the same words that indicate elevated CKMB results.

Conceptual Definition of Variables

Gender

Webster defines gender as "a person's sex" (Neufeldt & Sparks, 1990, p. 246). This researcher accepts this definition for this variable.

Acute Myocardial Ischemia

AMI includes new-onset angina pectoris, unstable pre-existing angina pectoris, and acute myocardial infarction (Pozen et al., 1980). The mechanism of myocardial ischemia helps to differentiate among these three categorizations of AMI. Myocardial ischemia occurs when the myocardial demand for oxygen exceeds oxygen supply and metabolite removal, most often due to vasospasm, or vascular occlusion. This results in ineffective cell functions. Ischemic myocardial muscle undergoes anaerobic metabolism. This leads to release of lactic acid, regional ischemia, and impaired left ventricular function (Bullock & Rosendahl, 1984). Ischemia is considered reversible, and restoration of cellular function can occur with restoration of oxygen to the affected muscle.

Angina pectoris is a manifestation of myocardial ischemia, characterized by squeezing, substernal chest pain that is often described as a feeling of tightness or fullness. Physiological response to the pain includes pallor, perspiration, and dyspnea. Angina may be precipitated by physical or emotional stress, and relieved by rest. ECG changes may include T-wave inversion, and S-T segment depression. Laboratory findings are usually normal (Bullock & Rosendahl, 1984).

Pozen et al. (1980) define those with new-onset angina as patients presenting with symptoms of angina pectoris for the first time, subsequently documented by S-T wave changes with pain, a positive exercise stress test, or a positive coronary arteriogram. These patients are considered "stable".

These authors go on to describe someone with unstable, pre-existing angina as one with a previously stable history of angina lasting at least three months, whose frequencies of episodes of angina have increased, or who had a worsening clinical picture. Bullock and Rosendahl (1984) refer to this pattern as preinfarction angina, indicative of CHD progression. Schroeder, Lamb, and Hu (1978) relate unstable angina to the presence of prodromal symptoms, but suggest the presence of these symptoms is not necessarily predictive of myocardial infarction.

Myocardial infarction (MI) results from prolonged ischemia to the myocardium, causing irreversible cell damage and cell death. Coronary artery flow is generally impeded by a combination of vasospasm, platelet aggregation, and thrombus formation. Myocardial tissue death results in increased demand for cardiac output from the surviving myocardium, dysrhythmias (Hedges & Kobernick, 1988); varied clinical manifestations; and in the release of intracellular enzymes, including creatine kinase (Bullock & Rosendahl, 1984).

This researcher accepts the categorization of Pozen et al. for acute myocardial ischemic disease for this study. Stable angina will be defined as new-onset anginal chest pain, characterized by reversible ischemia, and relieved by rest. Unstable angina will be defined as pre-existing anginal chest pain that is increasing in severity and/or frequency. Myocardial

infarction will be defined as myocardial ischemia that progresses to myocardial cell death, with subsequent liberation of intracellular cardiac enzymes, and varied clinical manifestations.

Chest Pain Quality

Pain is a personal, subjective experience, and can be expressed by one person to another orally, but the experience can never be transferred directly. Webster's dictionary (Neufeldt & Sparks, 1990) defines pain as the "physical or mental suffering caused by injury, disease, grief, anxiety" (p. 422). This dictionary defines quality as "that which makes something what it is; the characteristic element, basic nature, kind" (p. 481). Verbrugge and Steiner (1981) discuss quality in terms of seriousness, finding that when the physician perceives a health problem as serious, there is an increase in services and dispositions for follow-up care.

This researcher defines chest pain quality as the type of personally experienced anginal-type pain that can be described by adjectives or adverbs for comparison.

CKMB

Creatine kinase (CK) is an enzyme specific to brain, myocardium, and skeletal muscle cells. CK has three slightly different molecular forms, called isoenzymes. In this study we are only interested in creatine kinase-MB (CKMB), found predominantly in the myocardium, the only tissue containing sufficient CKMB to account for plasma increases (Underhill, Woods, Sivarajan Frolicher, & Halpenny, 1989).

During an MI, destruction of cell membranes occurs, releasing CK and CKMB into the blood. The first detectable lab abnormalities are elevation of CK and CKMB levels.

Marin and Teichman (1992) state that "confirmation of the diagnosis of infarction depends ultimately on the detection in blood of creatine kinase isoenzyme patterns indicative of myocardial necrosis" (p. 354). Mair et al. (1991) found that CKMB mass was the best diagnostic measurement for MI. Roberts (1984) reviewed MI diagnostic practices, and found agreement that CKMB is the most sensitive and specific diagnostic marker, and has become the conventionally accepted hallmark of acute MI. Sensitivity and specificity of CKMB will be discussed during the literature review.

This researcher defines CKMB as an isoenzyme of CK specific to myocardial cells, which is released into the bloodstream during myocardial injury, and is diagnostic for MI when found in elevated levels.

Other Variables

This researcher anticipates that older age, socioeconomic status (reflected by health insurance status), marital status and social support, and delay in care-seeking behavior may affect test outcomes, and could potentially become nuisance variables in the analysis of verbal descriptions of chest pain and CK/CKMB scores. Patients may delay care-seeking for chest pain, potentially increasing the severity of their disease outcome and their CKMB values for the following reasons: fear of the high cost of ED services and inadequate insurance coverage; and lack of social support encouraging care-seeking behavior (indirectly reflected in marital status).

Literature Review

The relationship between chest pain quality and gender and, secondarily, CKMB results brings up several subtle issues that need consideration. This literature review begins with a survey of CHD, and treatment modalities, as related to gender. Subsequent areas for exploration include: care seeking behaviors of men and women, and their perceptions and expression of illness; perceptions of care providers to client presentation (male or female); clinical decision making processes; and the sensitivity and specificity of a CKMB result as a diagnostic tool.

Sociodemographics of CHD

CHD is the leading cause of death in men and women in the United States. CHD affects about 7 million Americans, causing over 500,000 deaths annually, and killing as many people as all other diseases combined. CHD also costs taxpayers roughly \$43 billion per year in direct and indirect costs, and is one of the leading causes of disability (US. Department of Health and Human Services, 1990). Men had a higher incidence rate within all age groups, and were more likely to be first diagnosed with an acute form of CHD, whereas women were more often diagnosed with chronic CHD (Center for Disease Control, 1992). Investigators agree that

women with MI are typically older, and have a greater overall mortality rate (Greenland et al., 1990; Tofler et al., 1987).

Lack of social support is reflected in a 3-fold increase in mortality rates from CHD, in women (Eaker, 1989). Older women experience dramatically higher rates of singleness due to loss of spouse thorough death or divorce, and having never married. Three-fifths of women over age 65 are without spouses, whereas three-fourths of men in this age group are married (Jecker, 1991).

Clinical manifestations of MI can vary widely, but typically the patient presents with severe anterior precordial chest pain of a pressing or squeezing nature. This pain is not relieved by rest or nitroglycerine, and often radiates to arms, neck, or jaw. Physiological changes include nausea and vomiting, perspiration, weakness, extreme anxiety, dyspnea, and a subjective sense of impending doom (New York Heart Association, 1979). We must keep in mind that patients with an MI that do present for evaluation are the "survivors", as life threatening ventricular arrhythmias and sudden death before reaching help is a common complication of infarction.

MI may occur, but not be associated with typical anginal symptoms. These are considered "silent" infarctions, and may go unrecognized. "Silent" infarctions carry the same prognosis for long-term survival as recognized infarctions (Hedges & Kobernick, 1988).

Eysmann and Douglas (1992) discuss patient risk in terms of their prognosis and poorer outcome; severity of disease process and development of complications; and incidence of mortality found with AMI. Governmental agencies speak of risk as personal attributes or behaviors that increase or decrease the likelihood of developing a disease, morbidity and mortality, or disability. Some risks are identified as modifiable, i.e., smoking, obesity, and sedentary lifestyle (Center for Disease Control, 1992; Horton, 1992; U.S. Dept. of Health & Human Services, 1990).

Plotnick and Fisher (1985) define high-risk for AMI as the presence of a true pathogenic process like coronary thrombosis, coronary spasm, and/or progression of disease. Conversely, Pozen et al (1984) defines low-risk as a decreased likelihood of having AMI. In a study of

low-risk patients in the ED, Lee et al. (1985) determined low-risk by the combination of verbalizations of a "sharp" pain, chest wall pain that was positional, reproducible, pleuritic, and no prior history of angina.

Lerner and Kannel (1986) reviewed data from the Framingham Heart Study, initiated in 1948 to identify coronary risk factors in a community setting. They found that overall women experience half the amount of CHD as men, until old age. However, there was a 10-fold increase in CHD when comparing younger women (35 to 54 years) to older women (>55 years). Male risk for CHD increased only by a factor of 4.6 during the same age span.

The Framingham data, often considered the "gold standard" for cardiac studies, has come under criticism regarding the credibility of its epidemiological data, specifically the perception that angina pectoris is a benign problem in women. Lerner et al. found that anginal chest pain is a more common presentation in women than in men reporting chest pain. Eighty-six percent of angina in women was uncomplicated by coexistent MI, whereas male angina is more likely to be a sequelae of MI (66% uncomplicated). Men had a higher incidence of MI overall, and sudden death from MI, while women were found to have a higher mortality than men during an MI at every age level.

The Framingham data have shown that the clinical manifestation of a similar pathophysiological problem, coronary atherosclerosis, resulted in quite different outcomes in men and women. Wenger (1990) voices concern that these results betray a bias in treatment. She states:

"This flawed myth of better tolerance of angina fostered less attention to women with this symptom, less concern with their preventive care and coronary risk modification, and probably led to inappropriate decisions about objective testing for risk stratification with resultant lack of identification of high-risk women..." (p. 557).

The U.S. Public Health Service's Task Force on Women's Health Issues (Kirschstein, & Merritt, 1985) reports that treatment for women is based on research results largely established from male study subjects. Application of results, (in the form of treatment protocols), overlooks

that women may react differently to treatments from men, and that some diseases manifest themselves differently in women (Council on Ethical and Judicial Affairs, AMA, 1991).

Douglas (1986) believes that the differences in male and female responses render published results liable to inaccuracy regarding applicability of findings to all individuals. She sees gender-based research as a way to improve understanding of the pathophysiology that is the underlying basis of much health care practice.

Gender Differences in Treatment for AMI

Is there a gender bias in the diagnosis and treatment of AMI? When we consider clinical presentation for chest pain, men and women should receive the same diagnostic procedures, effective therapeutic services, and satisfactory dispositions for follow-up care. Verbrugge and Steiner (1981) believe that physicians rely on other factors that may prompt different procedures and care: general knowledge about disease prevalence, risk factors, and physiology by sex. Social and psychological effects may also influence care. Unless grounded in physiological differences, this represents biased care.

Studies of the differences in referral for coronary procedures found that women undergo fewer major diagnostic and therapeutic procedures than men (coronary angiography, angioplasty, bypass graft surgery). Researchers have speculated that this may represent either underuse in women or overuse in men (Ayanian & Epstein, 1991; Schmidt & Borsch, 1990). Women were more likely to require emergent cardiac surgery, experience higher operative mortality and perioperative infection, less relief of symptoms, and greater reocclusion rates with these procedures (Hawthorne, 1994). These effects may be attributed to later onset of disease in women by 10-20 years, poorer functional status and comorbidity on presentation, and smaller vascular physiology (Herman, 1993). Bickell et al. (1992) conclude that women were less likely to be referred for graft surgery among low-risk patients, but shared equal likelihood with men for referral as disease severity increased.

Exercise stress testing is less accurate in prediction of CHD in women. Even when results were abnormal, Tobin et al. (1987) found that men were 10 times more likely to be referred for

angiography. The difference in referrals was not explained by patient history, symptoms, or test results. Physicians considered anginal symptoms in women with abnormal test results to be more likely related to non-cardiac causes than they did in men, even though women were more symptomatic than men. However, an interesting note is that there was no difference in the prescription of antianginal medications.

Tissue plasminogen activator (TPA) is one of the newer drugs available for thrombolytic therapy during an MI. TPA, when given to eligible patients promptly on arrival to the ED, aids in reperfusion of ischemic myocardium by dissolving existing clots occluding coronary vessels. Cardiac muscle becomes reoxygenated, saving tissue and decreasing death from arrhythmias. The challenge of TPA, and the other thrombolytics, involves the timely identification of patients experiencing MI, and determination of eligibility for therapy. TPA therapy is most beneficial when initiated early, preferably within six hours of chest pain onset.

Two intriguing studies involving TPA therapy show characteristics related to gender. An analysis of factors causing prehospital delay in seeking care and obtaining appropriate thrombolytic therapy found that four variables were predictors of increased prehospital time. These were: slow symptom progression; low income; female gender; and being elderly (Schmidt & Borsch, 1990). Patients surveyed most frequently cited perception of their symptoms as "not serious" as the reason for not seeking care sooner. Hawthorne's (1994) qualitative study of gender and coronary surgery found that women perceived cardiac illness as an "expected" life event, compared to men, who perceived it as a crisis event. Women may be minimizing the seriousness of symptoms. It is possible that this may reflect the generally later onset of CHD in women. The older one gets, the more "expected" is any illness. In fact, this researcher contends that each of the four variables is pertinent to a woman's prehospital delay.

Maynard, Althouse, Cerqueira, Olsufka, and Kennedy (1991) looked at the role of gender in TPA eligibility, and its subsequent administration. They found that men successfully met eligibility criteria more frequently than women, and that men and women differed in their ineligibility criteria. As expected, the upper age limit of 75 years was exceeded more frequently

by women. When eligible, women received TPA less often (55%) than men (78%). The study could not answer why treatment was not given to women when eligible, due to lack of information on the patient record.

It appears that diagnostic and therapeutic treatments (and treatment efficacy) for AMI show gender bias, which in some instances is unwarranted. Greenland et al. (1991) summarize these studies when they recognize that women who develop MI are at greater risk for mortality, and deserve aggressive assessment and treatment, including thrombolysis.

Perception of Illness, and Care-Seeking Behaviors

Gender differences in utilization of health care have been hypothesized as due to differences in the way symptoms are perceived, evaluated, and treated (Hibbard & Pope, 1986). This researcher contends that one's perception of symptoms affects the description of symptoms to others, and one's care-seeking behaviors. The literature showed that several factors contribute to medical care utilization rates, but were inconsistent in conclusions regarding health perception and medical care utilization. Avis, Smith and McKinlay (1989) studied a person's beliefs about their susceptibility to a condition or disease. Research has shown that people tend to underestimate their own risk of developing certain conditions, or diseases, termed "optimistic bias", and that perceived susceptibility is essential in motivating alterations in behavior. Their results showed that in the case of CHD, self-perceived health status, along with established epidemiological risk factors, influences a person's perception of their risk for CHD.

Hibbard et al. (1986) postulate that women have a greater interest in health care in their role as "family nurse", thus making health issues more important to them. These authors conclude that a positive correlation exists between women's symptom perception, and interest in health, with higher medical utilization rates, especially for mild illness, due to low stigmatization for such actions.

Verbrugge and Steiner (1981) looked at patterns in medical utilization by gender, finding that women received more total services, dispositions for follow-up care, and minor diagnostic

services. Men received more major diagnostic services (ECG, X-rays, office surgery), counseling, and referrals to specialists.

Hawthorne (1994) identified themes in the perception of cardiac illness that are related to gender. Men regarded cardiac illness and events as a frightening confrontation with mortality, which stimulated a life reassessment, not unlike a "mid-life crisis". This makes sense when we remember that CHD manifests itself in the middle years in men. Men experienced a change in perspectives and priorities. Illness was seen as a tangible, and hence manageable phenomena. Men tended to search for causative factors of illness, and may experience an element of self-blame.

Women in Hawthorne's study (1994) tended to minimize symptoms, and the possibility of CHD. Women's cues to disease reflected an "otherness" orientation to relationships and family needs coming first, before attending to health problems. These results are in contrast to Hibbard's conclusions discussed previously.

Women reported having a personal physician with greater frequency, and longer waits to get an appointment time. This may reflect a pattern of routine use of services for primary care, and the establishment of a stable client-physician relationship. Some women are apt to use an obstetrician or gynecologist for their primary care, developing a history of ongoing care (Grimes, 1988).

The literature does not agree on the issue of physician perception of client behavior, raising questions about whether there is a difference in the way physicians perceive behaviors and symptoms of male and female clients. Physician gender may have an effect on study results, but because there is only one female ED physician at the study site, the available data for comparison of physician gender, perceptions, and interactions with male and female patients preclude addressing this issue in the current study.

Clinical Decision-Making

Clinical decision-making is an important part of the identification and treatment of patients presenting with AMI. The goal of decision-making is appropriate risk stratification of patients to

take advantage of therapy to reduce myocardial necrosis, and therefore morbidity, while at the same time screening low-risk patients to save resources and health care dollars (Alonzo, 1986).

Decision-making should be based on the interactions between biomedical knowledge, rigorous problem analysis, weighing of probabilities, and acceptance of risk. These interactions can be influenced by clinician-patient interactions and sociocultural setting (Eisenberg, 1979). Decision-making is difficult clinically, since it usually happens quickly, relies on large quantities of data, is mostly unconscious, and differs in style for different clinicians and presenting complaints.

Researchers have tried many strategies to improve the accuracy of emergency department triage and diagnosis of AMI. These strategies range from the identification of high-risk clinical indicators, and rapid access to laboratory studies (Marin & Teichman, 1992), to computer-based predictability protocols (Goldman et al., 1988), and 12-lead or 18-lead ECGs.

Various studies describe the high sensitivity that ED physicians have for identifying and admitting MI patients. Tierney et al. (1986) states that "implicitly or explicitly, physicians deal constantly in probabilities. ...one essential clinical skill is the ability to accurately estimate the probability of disease in individual patients..." (p. 12). This has been achieved at the expense of overdiagnosing and over-admitting low-risk patients (Lee et al., 1985; Pozen et al., 1980;). In the U.S., only 50% of the patients admitted to the coronary care unit (CCU) ultimately are diagnosed with AMI (Pozen, D'Agostino, Selker, Sytkowske & Hood, 1984).

The opening interview between care provider and client has been regarded as a critical time for negotiation between patient and physician concerning which verbal descriptions of symptoms and illness experiences are to be considered as serious, and addressed during that visit (Roter, Lipkin & Korsgaard, 1991). Diagnostic accuracy may be enhanced by careful attention to patient presentation and problem description, which may highlight patterns suggestive of high or low risk for AMI. Hedges and Kobernick (1988) reflect that clinicians must base clinical impressions on patient risk factors, presence of clinical abnormalities, circumstances that prompted care-seeking behavior, and on ***the degree of patient discomfort***

(chest pain quality), and ***the patients' description of the discomfort***. Hawthorne (1994) promotes the nurse as an effective bridge between caregivers, and patients, as nurses have long been accustomed to translating patient vernacular language into clinically meaningful language that could be used in pattern recognition.

CKMB as a Diagnostic Tool

CKMB accounts for 15 to 22% of total CK activity in diseased myocardium. Elevation of CKMB occurs rarely in other disease processes, but has been related to muscular dystrophy, hypothermia, alcohol overdose, Reye's syndrome, and poisoning. It may also be associated with heavy exercise (Gibbler et al., 1990; Underhill et al., 1989). CKMB activity can be documented in the serum 4-8 hours post-infarct, and follows a predictable rise and fall over a 3 day period, usually peaking at 24 hours after onset of chest pain (Lee & Goldman, 1986; Underhill et al. 1989). This is illustrated in Figure 1.

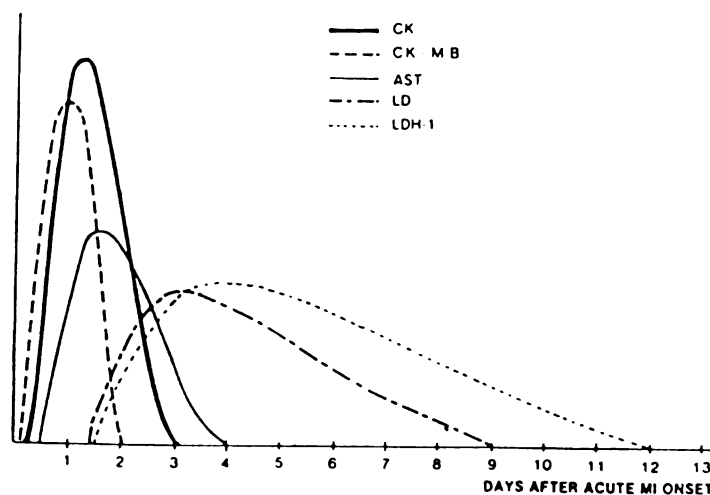


Figure 1. Patterns and timing of elevation of creatine kinase (CK), creatine kinase-MB (CKMB), and other cardiac enzymes. (Adapted by Underhill et al., (1989), from Ravel, R., (1984). Clinical laboratory medicine: Clinical application of laboratory data (4th ed.).)

The literature evaluates two diagnostic issues: 1. what are the specificity and sensitivity for CKMB; and 2. how frequently should CKMB be sampled?

Sensitivity of CKMB is defined as all patients with both MI and elevated CKMB levels, divided by all patients with MI. Sensitivity shows the true positive rate in patients with MI. Specificity is defined as all patients both without MI and with a negative CKMB level, divided by all patients without MI. Specificity is the true negative rate in patients without infarctions (Lee & Goldman, 1986).

Quantitative studies have demonstrated that elevation of serum CK and CKMB concentrations are the most sensitive test available for the diagnosis of AMI; they have also shown acceptable levels of specificity for documenting MI (Fisher et al., 1983). CKMB results show sensitivity of 95% to 98%, and specificity of 92% to 95%, when compared over a 24-hour period of serial measurements. (Dufour, 1987; Gibler et al., 1990; Lee & Goldman, 1986).

It needs to be kept in mind though that CKMB activity does not increase in serum until 4-8 hours after chest pain onset. This decreases sensitivity in the early stages of AMI, e.g., typically when the patient first presents to the ED, and has an initial CKMB level measured (Mair et al., 1991). Experts agree that a single measurement of CKMB in the ED shows a low specificity for exclusion of MI. Therefore serial CKMB measurements are recommended over the first 24 hour period after chest pain onset to increase diagnostic accuracy (Irvin, Cobb & Roe, 1980; Lee et al., 1987; Lee & Goldman, 1986; Marin & Teichman, 1992). Falsely negative results are rare, but may occur from inadequate sampling frequency (i.e., only once in 24 hours), or from sampling that is too late after infarction (when levels have returned to normal). The study site generally follows these recommendations for most patients admitted with AMI by measuring CKMB levels at 6 hour intervals in the first 24 hour period. The study site does not perform outpatient CKMB studies in follow-up for patients discharged from the ED.

In conclusion, this researcher believes that existing research has several strengths, but also shows several shortcomings. The literature review showed a general interest in exploring issues surrounding gender and cardiac health. It is evident that research efforts are beginning to

plumb the depths of the knowledge gap as far as effects and efficacy of coronary diagnostic and therapeutic measures for women go. Sociodemographic studies thoroughly discussed the incidence of CHD in the general population. An over-reliance on the Framingham Heart Study data was noted.

Health perception issues were interestingly covered from both patient and physician perspectives. However, physician perception data were based on ongoing primary care situations, rather than on perceptions of patients in crisis situations, as we would expect with AMI.

CKMB testing and efficacy were covered at great length in the literature, having been subjected to research for the last two decades. Refinement in methods, and in accuracy of results was evident.

Except for Hawthorne's article (1994) summarizing qualitative nursing research on post-operative cardiac patients, the general lack of literature addressing theory-based nursing issues and roles in the care of potential cardiac patients was dismaying. Advanced practice nurses do care for cardiac patients, and staff nurses in primary care or the ED are often involved in triage of cardiac patients. It appears that nurses either lack recognition of these roles, or are afraid to claim this expertise for themselves and acknowledge it as being within the realm of their practice.

Nevertheless, given the state of the literature, it was obvious that the process of patient history assessment, and clinical decision-making was downplayed in the diagnosis of AMI, when compared to cardiographic and laboratory data. Three articles briefly mentioned patient presentation and chest pain quality. One author conducted research using patient verbalization to identify low-risk patients, but results were not gender specific, and an explanation of methodology and verification of results was missing.

This researcher believes that assessment of patient presentation provides a contact with the patient that is rich with information and clues relevant to the etiology of their chief complaint. Current literature does not address the questions of possible gender-based differences in chest

pain description, and predictability of severity of disease based on patient verbalizations of chest pain quality. The present research study addresses these issues with the intent to strengthen assessment and history-taking as useful tools in the triage and clinical-decision-making process for patients experiencing chest pain.

Methods

Research Design

This study was based on a non-experimental, retrospective correlational design. This researcher did not have manipulative control over the independent variables, as the events under study had already taken place. According to Polit and Hungler (1991), correlational studies look at interrelationships between two or more variables, and the tendency for variation in one variable to be related to variation in another.

The independent variable identified for the first question is the gender of the patient. The outcome, or dependent, variable is the description of chest pain quality. This variable is measured by recording descriptive adjectives used by patients of different gender, and examining frequencies of their use.

The second research question is addressed by adding the descriptive adjectives as independent variables in addition to gender, and treating diagnosis and hospital admission to a critical care unit (yes, or no) as the outcome variables to be predicted.

The same two independent variables, gender of the patient and adjectives used to describe chest pain, were employed in the analysis related to the third question. Here, the outcome variable consisted of: 1. two creatine kinase (CK), and 2. two CKMB laboratory results (initial, and peak or 24 hour values) for each subject in the sample admitted for AMI.

Additional independent variables were explored as control variables, including: 1. age of patient; 2. marital status; 3. health insurance coverage (as a proxy for socioeconomic status i.e., Medicaid vs. others); 4. prior cardiac history; and 5. time from onset of symptoms to ED presentation. Cardiac history and time to presentation are included because of their influences on clinical decision-making and disposition.

Sample

Northern Michigan Hospital (NMH) in Petoskey, Michigan served as the study site. This hospital is a regional referral center, serving 350,000 residents in 24 counties in the northern lower peninsula, and eastern half of the upper peninsula of Michigan, and is available to residents in Ontario, Canada. NMH is a 299-bed facility, with an Emergency Department offering services on a 24 hour basis. Burns Clinic, which provides physician staffing for the ED, is the largest physician-owned and operated professional corporation in the state, supporting over 125 physicians, including six emergency physicians, six cardiologists, and two cardiac surgeons. NMH has 18 intensive care beds, and 30 cardiovascular beds. Two cardiac catheterization laboratories, and open heart surgery facilities are available.

The target population of this study included all men and women presenting to the ED at NMH with chest pain as their primary reason for seeking health care. A convenience sample was used, taking all patients that fit eligibility criteria. Although the primary sample of interest is women with suspected cardiac chest pain the study design requires the inclusion of eligible men and their descriptions of chest pain to allow evaluation of gender differences.

Projected sample size for the study was based on a review of the ED census log for January through March 1994. During these months, almost 200 patients were seen for chest pain. Review of the ED census log, to identify eligible patients, took place during the months of May, June, and August 1994. Northern Michigan experiences a large population increase during the summer months, due to vacationers, and the return of retirees. This had the potential to increase sample size.

Eligibility criteria for all questions included: men and women 30 years old and older, presenting with chest pain that is not related to trauma, or radiographic abnormalities (pneumonia, asthma, COPD). For the third research question, criteria also included admission to a critical care area with a diagnosis of AMI, and availability of CKMB results from admission, and at 24 hours.

Exclusion criteria included: 1. patients transferred from another hospital; 2. patients seen by physicians other than the six regular physicians employed by the Burns Clinic to staff the ED; 3. patients who died during prehospital treatment (i.e., during resuscitation efforts by Emergency Medical Services personnel).

Data Collection and Recording

Hospital records were obtained from the hospital's Medical Records Department. Data gathering occurred through retrospective chart review either of the ED record for patients presenting to the ED with chest pain who subsequently were discharged from the ED, or of the ED record and inpatient hospital chart for admitted patients.

According to Hayward, McMahon, and Bernard (1993), "review of the medical record is an integral part of evaluating the quality and appropriateness of inpatient care (p. 550). The Joint Commission on Accreditation of Health Care Organizations has established guidelines regarding basic information required in an ED record (Joint Commission of Accreditation of Hospitals, 1983). Guidelines pertinent to this study include proper documentation of patient identification, time and method of arrival; pertinent history of illness; diagnostic and therapeutic orders; reports of procedures, tests, and results; diagnostic impression; and final disposition. Data were collected by one researcher, providing consistency and reliability in coding.

Ethics

No identifying characteristics were included in the data coding process, to protect patient and provider confidentiality. Approval for this study was obtained from Michigan State University UCRIHS, and from Northern Michigan Hospital's Institutional Review Board before conducting the research (see Appendix A). Findings were forwarded to interested committees and staff at NMH, as desired.

Operational Definition of Variables

Operationalization of the variables gender (male or female) and chest pain quality (descriptive adjectives) has already been mentioned. CK and CKMB levels were measured on serum blood samples obtained from each patient by venipuncture, on admission to the ED. The

NMH laboratory uses the DuPont Dimension AR to run samples through an immunoinhibition enzymatic assay. Results are usually available within one hour. Follow-up of abnormal results is done by Baxter Stratus pH fluorescence immunoassay. If results are still reported as abnormal, due to interference, specimens are sent to the Burns Clinic laboratory for electrophoresis chromatography.

Normal values for total CK range from 35-232 U/L in men, and 21-215 U/L in women. Normal CKMB results are 0-13 mg/dl for both men and women. CKMB is also computed by the laboratory as a proportion of the total CK result: $(\text{CKMB divided by total CK}) \times 100$. Scores for CK and CKMB levels were recorded for each patient. The NMH laboratory protocol for reporting a CKMB result is available in Appendix B.

An admitting or ED diagnosis (for those sent home), and a discharge diagnosis for admitted patients was coded for each patient. Patients with a discharge diagnosis of MI, or unstable angina were considered "high-risk". Patients with a discharge diagnosis of angina pectoris, and those sent home from the ED were considered "low-risk".

Data Analysis Procedures

Data analysis was performed with the help of a computerized statistical analysis program, SPSS/PC+ (Norusis, 1992). Frequency data were generated for the demographic variables, and for identification of the most commonly occurring adjectives used to describe chest pain quality.

The Pearson Chi-square, or the Fisher Exact tests, were used to evaluate whether demographic variables showed any statistically significant interrelationships. The same analysis strategy was also pursued with the first research question to determine relationships between gender and chest pain description. Correlations were run on the most frequently used descriptive adjectives.

Logistic regression analysis was chosen to analyze the multivariate problems addressed in the second research question. This technique is appropriate when the outcome variable is dichotomous, and the influence of multiple predictor variables on the likelihood of one or the other outcome is to be investigated (Ihlenfeld, 1988).

Multiple regression analysis was used for the third research question involving the issue of predictability of elevated CKMB results. In these analyses the actual CKMB scores are the outcomes to be predicted. Accepted levels of significance were .05 for all methods and calculations.

Results

Demographics

Demographic data included patient gender, age, marital status, medical insurance status, prior cardiac history, and time from symptom onset to presentation to the ED. One hundred ninety-one people presenting to the ED with a primary complaint of chest pain were eligible for inclusion in the study during the period of investigation. One hundred one (52.9%) patients were men, and 90 (47.1%) were women. Sample age ranged from a minimum of 31 years, to a maximum of 91 years, with a mean age of 61.8 years.

Marital status showed statistically significant correlations with gender and patient age. Overall, 73.5% of the sample were married, 13.3% single, 2.8% divorced, and 10.5% were widows or widowers. Comparing marital status by gender, 84.4% of men were married, whereas only 61.2% of the women were married. Unmarried participants were more likely to be older, as shown by their mean age of 62.44 years (std. dev. = 19.5 years), compared to those who were married with a mean age of 60.91 years (std. dev. = 13.06 years.). No less than 75% of the men in any given age category were married. As an example, women lagged 24.1%, and 50% behind men for percentage of married participants among those 70-79 years old and those 80-89 years old, respectively.

Health insurance status was divided into four categories: those who had private insurance, Medicare, Medicaid, or no insurance. This information was used as a proxy for socioeconomic status among people under the age of 65 since women are less likely to have private health insurance, and more likely to rely on public assistance coverage, than men (Horton, 1992). 73.3% of participants had private medical insurance, 51.8% had Medicare,

4.2% had Medicaid, and 2.1% had no insurance. Sixty-two people had both private insurance and Medicare coverage.

Correlations between gender and insurance status were significant for private insurance, in that 81.2% of men, versus 64.4% of women had this type of insurance. No significant difference was demonstrated between gender and other types of insurance. Because of the low Medicaid distribution, insurance status was not used as a variable in further analysis equations.

Prior cardiac history was also divided into four categories: patients with a history of angina pectoris, unstable angina pectoris, myocardial infarction, or "other" cardiac history that included such diagnoses as congestive heart failure, arrhythmias, cardiac surgery, valve dysfunction, and pacemaker placement. 45.5% of those eligible had a prior history of angina pectoris; 7.9% had unstable angina pectoris; 24.6% had a history of myocardial infarction; and 57.1% had other types of cardiac history. 33% of those presenting with chest pain had no prior cardiac history at all, while at the other end five persons had cardiac histories covering all four categories.

The time from symptom onset to patient presentation at the ED may be a factor in the decision to use thrombolytic therapy in those patients experiencing a myocardial infarction. Patients were evaluated to see if they presented in six hours or less from symptom onset, or in greater than six hours. Six hours was chosen because older TPA protocols were less likely to qualify patients as eligible for therapy if they waited longer than six hours to seek evaluation for chest pain. In this study 47.1% presented within six hours, with 52.9% waiting longer than six hours. Overall, there was no significant difference in time to presentation based on gender or prior cardiac history, and this variable was not used in further analysis.

Admission statistics for diagnosis and age by gender are presented in Table 1. Admission statistics were fairly consistent for men and women, by diagnosis. However, we see that men were more likely to be admitted than sent home after the age of 50 years, while women were less likely to be admitted than discharged from the ED until after the age of 60 years, that is, ten years older than men.

Admitting diagnosis was compared to inpatient discharge diagnosis, by gender, and is presented in Table 2. Obviously, 100 percent of the patients admitted with MI (8 patients) correspondingly had a discharge diagnosis of MI. But, almost double that number of patients, (15 patients) were determined to have had an MI by their discharge date. In men, 14.7% admitted with unstable angina, and 50% (in this case, 1 patient) admitted with "other cardiac" diagnosis had findings indicative of MI by discharge. 3.6% of women (again, 1 patient) admitted for unstable angina subsequently had an MI.

Table 1. Admission Statistics for Diagnosis and Age by Gender

<u>Admission Statistics</u>		<u>Percent Admitted</u>	<u>Percent Discharged</u>
Total		60.7	39.3
Gender	Male	62	38
	by Diagnosis		
	Angina Pectoris	45.9	54.1
	Unst. Angina	100	0
	MI	100	0
	Other Cardiac	100	0
	Unknown Cardiac	50	50
	Non-cardiac	0	100
	by Age		
	30-39 yr.	12.5	87.5
	40-49 yr.	46.2	53.8
	50-59 yr.	63.6	36.4
	60-69 yr.	77.8	22.2
	70-79 yr.	75	25
	80-89 yr.	55.6	44.4
	90-99 yr.	50	50
	Female	58.9	41.1
	by Diagnosis		
	Angina Pectoris	58.3	41.7
	Unst. Angina	100	0
	MI	100	0
	Other Cardiac	100	0
	Unknown Cardiac	NA	NA
	Non-cardiac	4.3	95.7
	by Age		
	30-39 yr.	0	100
	40-49 yr.	21.4	78.6
	50-59 yr.	37.5	62.5
	60-69 yr.	80.6	19.4
	70-79 yr.	75	25
	80-89 yr.	84.6	15.4
	90-99 yr.	100	0

Table 2. Comparison of Admitting Diagnosis and Discharge Diagnosis by Gender

Discharge Diagnosis # of patients (percent)	Admitting Diagnosis # of patients (percent)				Row totals
	Ang. pectoris	Unst. Angina	MI	Other cardiac	
Ang. pectoris					
Men	8 (47.1)	12 (35.3)	0	0	20 (33.3)
Women	11 (52.4)	5 (17.9)	0	0	16 (30.8)
Unstable Angina					
Men	0	12 (35.3)	0	0	12 (20.0)
Women	1 (4.8)	16 (57.1)	0	0	17 (32.7)
MI					
Men	0	5 (14.7)	7 (100)	1 (50)	13 (21.7)
Women	0	1 (3.6)	1 (100)	0	2 (3.8)
Other cardiac					
Men	3 (17.6)	2 (5.9)	0	0	5 (8.3)
Women	0	3 (10.7)	0	2 (100)	5 (9.6)
Unknown cardiac					
Men	1 (5.9)	0	0	0	1 (1.7)
Women	1 (4.8)	0	0	0	1 (1.9)
Non-cardiac					
Men	5 (29.4)	3 (8.8)	0	1 (50)	9 (15.0)
Women	8 (38.1)	2 (7.1)	0	0	10 (19.2)
Death					
Men	0	0	0	0	0
Women	0	1 (3.6)	0	0	1 (1.9)
Column totals					
Men	17 (28.3)	34 (56.7)	7 (11.7)	2 (3.3)	60 (100)
Women	21 (40.4)	28 (53.8)	1 (1.9)	2 (3.8)	52 (100)

Research Questions

Research was conducted to evaluate how men and women described the quality of their chest pain during initial assessment in the ED. Thirty-nine descriptive adjectives were used by eligible participants, and are presented in Table 3. The frequency statistics reflect that some participants used more than one adjective when describing their pain. One hundred two people used only one word; 52 used two different adjectives; 29 used three adjectives; 7 used four adjectives; and one person used five different adjectives.

Adjectives were identified as "frequently used" if they occurred at least seven (3.7%) or more times in the patient records. The ten most frequently used adjectives were "ache", "burning", "dull", "heavy", "pain", "pressure", "sharp", "stabbing", "tight", and "weight". These ten adjectives form the basis of investigation for the research questions.

Correlation analysis was done for these ten adjectives. Slightly positive correlations were found between the words "heavy" and "weight", and between "sharp" and "stabbing", indicating that those who said "heavy" or "sharp" were also somewhat more likely to say "weight", or "stabbing", respectively. A small negative correlation was found between the word "sharp" and the words "burn", "pressure", and "tight". All correlations were smaller than $\pm .27$. Gender analysis of all of these correlations showed no significant differences by groupings of words.

However, since for the majority of the patients only a single adjective was reported, these correlations are based on small varying numbers of cases. Nonetheless, they indicate that, among patients that used multiple descriptors of their experience, no identifiable clusters of descriptors emerged. As a result, the following gender comparisons will focus on the 10 individual adjectives most frequently recorded.

Table 3. Descriptive Adjectives

<u>Adjective</u>	<u>Frequency</u>	<u>Percent</u>
Ache	39	20.4
Ball in chest	1	0.5
Breathless	1	0.5
Burning	20	10.5
Clenched fist	1	0.5
Cold	1	0.5
Constant	2	1
Constriction	3	1.6
Cramp	4	2.1
Crushing	2	1
Deep	2	1
Discomfort	4	2.1
Dull	15	7.9
Flutter	1	0.5
Fullness	3	1.6
Gaslike	3	1.6
Grabbing	4	2.1
Heavy	26	13.6
Hot flash	1	0.5
Hurt	3	1.6
Jabbing	3	1.6
Knifelike	3	1.6
Mild	1	0.5
Numbness	1	0.5
Pain	8	4.2
Pressure	58	30.4
Punched	1	0.5
Pushing	1	0.5
Sharp	49	25.7
Shooting	3	1.6
Sore	4	2.1
Squeezing	6	3.1
Stabbing	7	3.7
Tender	2	1
Throbbing	1	0.5
Tight	32	16.8
Twinge	1	0.5
Viselike	1	0.5
Weight	7	3.7

The Pearson Chi-square or Fisher's Exact test was used to address the first research question. The comparison of how men and women describe their primary symptom of chest pain found significant differences in the use of three adjectives: "heavy", "pain", and "tight"; by gender (see Table 4). Women were more likely to use the adjective "heavy" while men were more likely to use the adjectives "pain", or "tight". No other significant gender differences were found among the remaining adjectives.

Table 4. Adjective Use by Gender

<u>Adjective</u>	<u>Percent Male</u>	<u>Percent Female</u>	<u>Significance Level</u>
Ache	18.8	22.2	0.5594
Burning	10.9	10	0.8408
Dull	7.9	7.8	0.9704
Heavy	6.9	21.1	0.0043*
Pain	5.9	2.2	0.0002*
Pressure	32.7	27.8	0.4627
Sharp	21.8	30	0.1942
Stabbing	3	4.4	0.5883
Tight	22.8	10	0.0183*
Weight	3	4.4	0.5883

The second research question asked whether descriptions of chest pain quality predicted hospital admission to a critical care area, and if so, were the same adjectives predictive for men and for women? Logistic regression was used to determine association between adjectives and admission. Because other factors may influence the clinical decision-making process, the variables for initial CKMB results, and prior cardiac histories were included in the analysis.

Two adjectives were found to be predictive of the likelihood of admission depending on the gender of the patient (see Table 5). Men using the term "pressure" (signif. = .0248) were more likely to be admitted to a critical care area than discharged home, as were women using

the term "heavy" (signif. = .0398). Other adjectives were not found to be predictive of hospital admission. It was found that women with "other" cardiac history (arrhythmias, surgery, etc.), were also more likely to be admitted than sent home. This variable did not predict hospital admission among men.

Table 5. Prediction of Hospital Admission to a Critical Care Area

<u>Variable</u>	<u>Significance Level</u>		
	<u>Overall</u>	<u>Male</u>	<u>Female</u>
Ache	0.7531	0.5711	0.6592
Burn	0.7497	0.9917	0.6593
Dull	0.5087	0.7406	0.924
Heavy	*0.0156	0.2057	*0.0398
Pain	0.2412	0.869	0.9475
Pressure	*0.0059	*0.0248	0.0737
Sharp	0.5047	0.4092	0.4877
Stabbing	0.5497	0.3394	0.5835
Tight	0.161	0.9209	0.8556
Weight	0.4757	0.1744	0.8934
Gender	0.9356	constant	constant
CKMB1	0.246	0.2858	0.0706
Cardiac History (A. Pectoris)	*0.0208	0.2789	0.0545
Unst. Angina	0.724	0.7897	0.8895
MI	0.3331	0.1129	0.8407
Other Cardiac	*0.01	0.1857	*0.0065
Number of Eligible Cases	170	90	80

The third research question used multiple regression to analyze whether descriptive adjectives as used by women and men were diagnostically accurate predictors of elevated CKMB results, and therefore indicative of MI. A few extremely high CKMB outliers were excluded from the analysis to decrease the skewness of the dependent variable, in an attempt to normalize the curve of distribution values. Frequency studies showed that 75% of the sample had initial CK values below 108 U/L, and peak CK values equal to or below 99 U/L. Initial and peak CKMB values averaged below 4 mg/dl for 75% of the sample.

There were no statistically significant regression coefficients for the descriptive adjectives used by the group as a whole, and their initial CK and CKMB values. Significant coefficients were found for gender as predictor of initial CK and CKMB values, with women averaging 30.32 U/L below the men's total CK values, and 2.017 mg/dl below male CKMB values. There were no significant regression coefficients for the descriptive adjectives, or gender, to predict peak CK and CKMB results. These results are presented in Table 6a.

Table 6a. Overall Prediction of Elevated CK/CKMB Results

<u>Variable</u>	<u>Initial CK</u>		<u>Initial CKMB</u>		<u>Peak CK</u>		<u>Peak CKMB</u>	
	<u>B(^)</u>	<u>Signif. Level</u>	<u>B</u>	<u>Signif. Level</u>	<u>B</u>	<u>Signif. Level</u>	<u>B</u>	<u>Signif. Level</u>
Gender	-30.32	*0.0056	-2.02	*0.0183	-80.78	0.2289	-13.27	0.0696
Ache	2.19	0.8691	-0.37	0.72	23.15	0.7863	-5.05	0.5879
Burn	0.52	0.9788	0.08	0.9568	-4.92	0.9572	13.1	0.2782
Dull	-18.43	0.3289	0.44	0.7704	-53.54	0.5816	-7.63	0.5167
Heavy	-15.2	0.315	0.55	0.6517	26.68	0.7512	3.81	0.6694
Pain	-1.63	0.9512	-1.82	0.3845	21.37	0.8771	-5.5	0.7461
Pressure	7.38	0.5369	0.57	0.5449	43.23	0.5567	7.35	0.3493
Sharp	13.1	0.3616	-0.64	0.5671	2.75	0.9765	-2.27	0.8199
Stabbing	-35.36	0.1823	1.05	0.629	-112.3	0.665	-0.41	0.9911
Tight	5.75	0.6846	-1.8	0.1189	129.71	0.1391	-0.33	0.9692
Weight	43.62	0.1004	0.44	0.3645	-32.38	0.7843	-13.01	0.3902
% Variance Accounted For	11.2		5.4		10.4		8.6	

(^) B = Regression Coefficient

An interaction effect was found when regression analysis was done for peak CKMB results and adjective use specifically by female or male gender (see Table 6b). Women who used the word "heavy" had CKMB results 11.74 mg/dl higher than women not using the term (signif. = .0482). No such effect was found in the male subsample. Again, the contribution to explained variation in the dependent variable by this variable remains very small.

Table 6b. Gender-Based Predicted Elevation of Peak CKMB Results

<u>Variable</u>	<u>Male</u>		<u>Female</u>	
	<u>B(^)</u>	<u>Signif. Level</u>	<u>B</u>	<u>Signif. Level</u>
Gender	-24.08	0.1323	constant	
Ache	-19.82	0.3405	5.84	0.3904
Burn	-0.845	0.7489	-8.49	0.3793
Dull	-23.92	0.355	-1.99	0.8135
Heavy	-3.38	0.8632	11.74	*0.0482
Pain	-37.89	0.3101	-6.66	0.6119
Pressure	-13.31	0.4377	-7.26	0.219
Sharp	-25.1	0.2516	-6.14	0.4016
Stabbing	32	0.6921	4.41	0.8195
Tight	-18.39	0.328	-7.41	0.2855
Weight	-13.93	0.6754	-5.01	0.6087
% Variance Accounted For	6.6		18.1	

(^) B = Regression Coefficient

Other Findings

Out of curiosity, this researcher compared the discharge diagnosis of MI with descriptive adjective use. Fifteen patients were discharged with MI. Twenty percent initially described their pain as an "ache", 6.7% as "burning", 6.7% as "dull", 20% as "heavy", 13.3% as "pain", 40% as "pressure", 13.3% as "sharp", and 20% as "tight". These percentages add up to more than 100% because some patients used more than one adjective. None of the MI patients used the words "stabbing", or "weight".

Interpretation of Findings

There is some evidence that women and men use different terms in their subjective description of chest pain on presentation to the ED. Women were more likely than men to use the term "heavy"; men were more likely than women to describe their pain as "tight", or "pain". Without interviewing each subject individually, it is difficult to conclude whether this difference is due to a difference in perception of the pain, or to an actual difference in manifestation of the disease and its symptoms in women and men, questions that were raised in the literature.

Chest pain quality description was marginally predictive of hospital admission to a critical area, with women using different specific adjectives from men. Women using the adjective "heavy" were more likely to be admitted than women who did not use this term, or than men in general. Men using the adjective "pressure" were more likely to be admitted than men who did not. Different adjectives were predictive for women and for men, with predictive strength higher for women. It is interesting to note that the term "heavy", more likely to be used by women, is also predictive of their hospital admission.

Correlations found between gender and initial CK and CKMB values are reflective of the normal values used by the NMH laboratory for these tests, with women having a lower normal CK limit. Specific adjective use was not found to be a diagnostic predictor of elevated initial CKMB results, and therefore is not useful as a tool to predict AMI and severity of disease.

The adjective "heavy" was found to be predictive for abnormally elevated peak CKMB results in women, but not in men. This term has consistently shown significance when used by

women through all three research questions. We can conclude that women who describe their chest pain as "heavy" are more likely to require hospital admission, and to have abnormally elevated peak CKMB results, indicative of increasing severity of disease process. While ED nurses may not see elevated initial CKMB results in these women, they can anticipate the level and type of nursing care necessary to provide initial treatment, and can initiate appropriate patient care protocols. This is consistent with Benner's hypothesis that experience builds paradigms for expertise in nursing practice. Expert nurses who have taken care of many patients with chest pain build on past knowledge to make graded qualitative distinctions in severity of chest pain, and use this knowledge in clinical decision making.

Admission statistics confirmed results reported in the literature (Herman, 1993; Verbrugge & Steiner, 1981) that found that the onset of cardiac disease begins approximately ten years later in women than in men. However, perhaps these statistics are a reflection of bias in risk appraisal towards placing women in a lower risk category based on their gender (Lerner & Kannel, 1986; Wenger, 1990).

Several factors discussed in the literature could influence findings related to the increased numbers of MIs that were diagnosed by inpatient discharge, compared to those diagnosed in the ED. Since CKMB rises to detectable levels 4-8 hours after infarct, patients presenting promptly following onset of chest pain will not have elevated CKMB levels initially, but will peak after admission, if their MI evolves. Additionally, those admitted with prodromal unstable angina may also progress to MI, or a patient may have a new onset of angina and MI after admission. Finally, we have to consider the question of whether the diagnosis was missed by the physician on admission. The literature shows that single measurement of CKMB in the ED has low sensitivity for exclusion of MI, and recommends serial measurement for accurate diagnosis. The study site does not perform outpatient serial follow-up of CKMB for those patients discharged from the ED, and may miss a borderline case that is actually an evolving MI. In fact, at least two patients sent home from the ED returned within 24-48 hours with a continuing complaint of chest pain, and subsequently were admitted with an MI. Protocol changes reflective of standards as

defined in the literature allowing for follow-up outpatient CKMB studies within 12 to 24 hours after a patient is seen and discharged from the ED could correct this problem.

Patients who were discharged after admission with a diagnosis of MI were inconsistent in their descriptions of the same phenomena (MI), with the exception of the use of the term "pressure". Similar words were used to describe MI, angina pectoris, unstable angina, and other cardiac problems.

Coming to the ED for any type of problem is often perceived by many as a crisis, let alone coming in for a potentially life-threatening symptom like chest pain. Perceived crises initiate stress responses that may initially cloud a person's judgment or perception. This researcher, having worked as a nurse for six years in the ED at the study site, and having cared for many patients with chest pain, has seen first-hand the confusion that some patients, especially the elderly, experience when asked by care providers to qualitatively describe their chest pain. Care providers attempting to assess chest pain quality may "offer" adjectives to patients who are unable to articulate descriptions themselves, such as "does it feel like a pressure, or sharp?". Suggesting adjectives to patients may alter study results as care providers try to grasp the patient's perception of chest pain quality, and patients grasp for answers to questions about symptoms that are hard to describe.

Discussion

Implications for Advanced Nursing Practice and Primary Care

Nurses working in advanced practice in such varied primary care settings as family practice, internal medicine, and emergency nursing will frequently care for patients with chest pain, chronic cardiac disease, or those at risk for developing cardiac disease. Nurses are often the first health care provider that the patient interacts with. Nurses must have the clinical knowledge to recognize high risk patients presenting with chest pain, to accurately assess the situation in a holistic manner, and to manage patient care through clinical decision making and the use of paradigms that initiates appropriate patient care. This insures the best possible outcome for the patient, that is, preservation or salvage of cardiac muscle tissue.

This research study demonstrates that nurses cannot rely on a patient's description of the quality of their chest pain as an assessment tool for **severity of disease**. Patients experiencing chest pain use several different terms to describe the same disease process, and use similar terms to describe differing types of disease like angina and MI. While women and men may describe their chest pain differently, and this description may lead to different outcomes (discharge or admission), descriptions cannot be used as a "cookbook" method for predicting which patients are at risk for elevated CKMB values, and for MI.

The "formal" role of nursing versus recognition that actual nursing practice may extend beyond the usual boundaries of nursing practice in rapidly changing situations such as dealing with patients with chest pain reflect clinical expertise gained over time. Nurses in advanced practice meld the scope of their nursing practice and their focus on health and holistic patient care with the medical model of disease recognition and treatment. APNs recognize disease, as well as symptoms, and initiate nursing care that helps manage symptoms, and minimizes the effects of disease.

APNs in primary care settings are skilled in assessment of history of the present illness (HPI), and easily apply this technique to patients with chest pain. Their assessment includes: the usual state of health, chronology of symptoms, location, quality, quantity, setting, aggravating and relieving factors, associated manifestations, disabilities, and pertinent negatives. It is obvious that patient description of chest pain quality is only one piece in the overall assessment of chest pain. The APN can then collaborate or make the decision to refer the patient to the nearest ED, to provide supportive care until transport can be arranged to a facility equipped to care for cardiac problems, or to provide definitive care in the primary care setting if the pain does not seem to be of a cardiac nature. A system for telephone triage and collaboration with a physician is a must for APNs who may be practicing solo in a rural or off-site setting.

Physical examination usually is an ongoing process during history gathering for the patient with suspected cardiac etiology, and often is begun by the nurse. Objective data gathered during exam includes vital signs, skin signs (color, temperature, diaphoresis, edema), oxygen

saturation and pulmonary assessment, cardiac rhythm and sounds, ECG, weakness, and reproducibility of pain. All of this is within the scope of nursing practice, and aids in clinical decision making.

Benner had several ideas that are reflective of the results achieved in this study. She believed that expert nurses learn to recognize subtle physiological changes, to make qualitative distinctions about changes observed, and to communicate these changes in a collaborative manner to the physician. Many times this is done before objective data are available (CKMB values). Clinical knowledge is refined over time, and nurses use past experiences (caring for other patients with chest pain) as paradigms to guide and manage rapidly changing patient care situations, while incorporating patient care standards into the scope of their nursing practice.

Assessment of patient verbalizations of chest pain quality is a subtle skill involving clinical judgment, and is often overlooked as nurses strive to learn the latest technological procedures. Benner stresses that nurse educators must recognize the connection between assessment and clinical judgment, and focus curriculum on this important aspect of skill acquisition. APNs need to work to legitimize the history assessment aspect of their practice, to seek the opportunity to function in this role, and to extend practical and theoretical knowledge by sharing these skills with novice and beginning nurses through mentoring.

Implications for Current Literature and Future Research

The results of this study highlight five points in the current literature. The first three points deal with the process of clinical decision making, and the last two with gender-based research. First, results of this study give some support to the idea that diagnostic accuracy may be enhanced by careful attention to patient presentation, and problem description, which may highlight patterns suggestive of high or low risk for AMI. Health care providers cannot rely solely on patient description of symptoms, due to the possibility of differing perceptions or manifestations of the same disease process.

Second, this research supports the idea that clinical decision-making is an important part of the identification and treatment of patients presenting with AMI, and is well within the realm of

the APN in primary care. Patient verbalization may cue the APN to the possibility of hospital admission, specific to gender.

Third, Tierney et al. (1986) believed that one essential clinical skill is the ability to accurately estimate the probability of disease in individual patients. Results of this study show those patient descriptions of chest pain quality in this instance do not sufficiently strengthen the probability for elevated initial CKMB values, and thus is not an indicator for severity of cardiac disease (MI).

This study showed that there were some differences in how women and men described chest pain symptoms. Additionally, several gender-based differences were found and described earlier in the sample demographics, and in related findings regarding admissions and diagnosis. This researcher agrees with Douglas (1986), in that gender-based research can be a way to improve understanding of pathophysiology that underlies the basis of much health care practice. Differences in male and female responses may lead to inaccuracy if results are applied indiscriminately to all individuals. Treatment for women based on research results largely established from male study subjects overlooks that women may have differing perceptions and presentations than men with similar complaints.

This study could serve as a springboard for future research in the areas of patient perception of chest pain, and gender responses to treatment. This study was done in an ED that regularly sees large numbers of patients with chest pain. Patients with non-cardiac etiologies for their complaints were excluded from this study, but a broader study could be done to determine whether chest pain quality descriptions can distinguish non-cardiac from cardiac etiologies.

Follow-up research could be done for patients admitted with chest pain. Discussions with cardiovascular nurses have raised similar questions about how inpatients perceive chest pain symptoms, and of differing responses by physicians to patient complaints of chest pain based on gender.

Cardiac rehabilitation nurses working with cardiac patients at the study site believe that patients change how they describe their chest pain symptoms as they progress through

rehabilitation. This is probably due to the influence of the nurses themselves, as they work with patients to help them accurately describe symptoms. Research could investigate how patient descriptions change over time with exposure to cardiac rehabilitation education, and assess whether patients become more homogenous in their descriptions, or more accurate in describing differing cardiac manifestations like angina pectoris.

Research with patients undergoing cardiac catheterization opens the possibility of verifying severity of disease with patient descriptions. Also, at the study site, MI patients receiving TPA therapy undergo cardiac catheterization after receiving drug therapy. Their verbalizations could be compared to patients presenting with angina pectoris, or unstable angina to determine if disease etiology really correlates with chest pain description, and if gender differences have a physiological basis.

Finally, primary care providers could be studied to determine how or if recognition, assessment and clinical decision making skills change when caring for female cardiac patients before and after being provided with education from study results.

Limitations of Research

This research was subject to limitations that may affect applicability of results to a generalized population of cardiac patients. First, a non-random, convenience sample was used. This researcher recognizes that ethnicity, cultural background, age, pain tolerance level, and education are some factors that may influence how pain is experienced, and expressed. Comparing subjects with similar backgrounds that could take these factors into account may alter test results. For example, someone with more education will have a larger vocabulary to choose from when describing pain than someone with fewer years of schooling.

While it was hoped to have double the number of subjects in the study, sample size was ultimately dictated by time constraints, and hospital Medical Records policies that made access to patient records difficult at times, and decreased the number of records that could be analyzed at any one time. Reliability of data was ensured by having one researcher encode data from patient charts. However, this may incorporate a systematic bias into study results, limiting

validity. This could be bypassed by standardizing chart review processes, and training multiple reviewers in objective review methods.

While male patients were more likely to use the adjective "pain", it is felt that this term may really be a catch-all term that was used when physicians or nurses did not document patient descriptions in a more accurate manner. In fact, when comparing physicians' and nurses' charting on the same patient, it becomes apparent that patients may be describing their chest pain in different ways to different care providers. This researcher has experienced this situation. Since research results showed no significant correlations between groupings of adjectives, one has to wonder if patient perceptions change; if patients become confused about quality questions; if care providers are documenting accurately and consistently; or if patients are really feeling several types of pain at once. This becomes an important methodological issue in that one would need to standardize the procedure for recording patient verbalizations of chest pain.

The documentation issue could be resolved in several ways. Patients present to the ED 24 hours a day, and are cared for by a rotating staff of physicians and nurses. Initial interviews between patient and care provider could be audio recorded to verify documentation with verbalizations. Patients could be interviewed after admission, or by telephone if discharged, by trained objective interviewers, providing more consistency in documentation. This would require seeking permission individually from each subject to be part of the study group, which was not necessary in the present study.

Patient responses could be standardized without care providers "offering" biased choices of pain descriptors by printing up a listing of adjectives used by subjects in the present study. This could be shown to patients during interviews about the description of their chest pain quality, allowing them to use the list as a reference tool.

The issue of physician gender and perception of patient care-seeking behaviors is an important one that could not be addressed in the present study. Physician gender affected the length, content, and structure of patient visits in a study by Roter, Lipkin, and Korsgaard (1991). Three similar studies (Bernstein and Kane, 1981; Greer, Dickerson, Schneiderman, Atkins, and

Bass ,1986; Verbrugge and Steiner, 1981) investigated client gender and physician treatment for ambulatory care patients in primary care settings. Medical care was similar for both sexes in the studies, but Verbrugge et al. found that men scored higher on both extent (depth of medical history and examination, and number of diagnostic tests ordered); and content (proportion of procedures deemed diagnostic for the complaint, that were performed). Both gender and client verbal expressions of the complaint were rated as important factors in physicians' response. This could be addressed at a facility employing more female ED physicians than the study site.

Finally, a limited number of subjects had highly abnormal CK and CKMB results that skewed mean and mode calculations, and normality of curve shape in the regression analysis for the third research question. Results came more into line with expected findings after these cases were factored out of the analysis.

Summary

There appears to be a difference in how women and men describe their primary symptoms of chest pain on presentation to the ED. This difference may cue the care provider to the possibility of hospital admission, but not to the probability of elevated initial CKMB results as an indicator of severity of disease. The APN gains expertise in recognition of high-risk cardiac patients by the use of paradigms. Knowledge about how cardiac patients describe their chest pain, and the possible implications of these descriptions strengthen the assessment and diagnostic component of the APN role, and is a skill that can be acquired through education, and collaboration on clinical judgment with other care providers, and shared through mentoring.

APPENDICES

APPENDIX A

Study Approval Letters

**MICHIGAN STATE
UNIVERSITY**

May 27, 1994

TO: Barbara C. Jaquith RN
8274 W. Stutsmanville Rd
Harbor Springs, Mi 49740

RE: IRB#: 94-254
TITLE: CHEST PAIN QUALITY DESCRIPTION AS A PREDICTOR OF
ACUTE MYOCARDIAL ISCHEMIA: IS THERE A GENDER
DIFFERENCE?
REVISION REQUESTED: N/A
CATEGORY: 1-E
APPROVAL DATE: 05/27/94

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

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

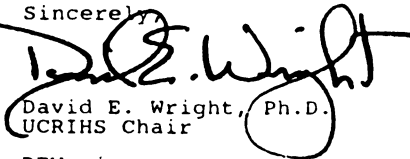
REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair,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

**PROBLEMS/
CHANGES:**

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

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)336-1171.

Sincerely,



David E. Wright, Ph.D.
UCRIHS Chair

DEW:pjm

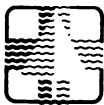
cc: Manfred Stommel



OFFICE OF
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STUDIES**

University Committee on
Research Involving
Human Subjects
(UCRIHS)

Michigan State University
225 Administration Building
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517/355-2180
FAX 517/336-1171



Northern Michigan
Hospital

Committed to Intensive Caring

August 2, 1994

Ms. Barbara Jaquith, RNC, BS
Department of Emergency Medicine
Northern Michigan Hospital
Petoskey, MI 49770

RE: **"CHEST PAIN QUALITY DESCRIPTION AS A PREDICTOR OF ACUTE MYOCARDIAL ISCHEMIA: IS THERE A GENDER DIFFERENCE"**

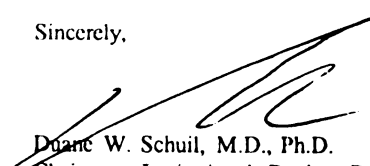
Dear Ms. Jaquith,

At their July 20, 1994 Meeting, the Northern Michigan Hospital Institutional Review Board voted unanimously to approve the above referenced new study.

Approval of the above named protocol is for one year and is contingent upon the investigator fulfilling responsibilities as outlined in the Code of Federal Regulations, Title 21, to include:

1. Prompt reporting to the I.R.B. of changes in the research activity.
2. Prompt reporting to the I.R.B. of unanticipated problems involving risks to human subjects or others.
3. Obtaining I.R.B. approval for protocol changes before initiating those protocol changes, except when necessary to eliminate apparent immediate hazards to human subjects.

Sincerely,



Duane W. Schuil, M.D., Ph.D.
Chairman, Institutional Review Board

DWS/sh

Institutional Review Board Members:

Duane W. Schuil, M.D., Ph.D.
Mark J. Bielaczyc, M.D.
Gary H. Shaw, M.D.
David L. Behling, Chaplain
Connie Fisher
Nick Michels, MS, DNSc, RN
Bob Wilcox, RPh

116 Connable Avenue

Petoskey, Michigan 49770-2207

616-433-1000

APPENDIX B

CHEMISTRY DEPARTMENT TECHNICAL MANUAL-CKMB

Clinical Laboratory, Northern Michigan Hospital, Petoskey, Michigan 49770

TITLE: CKMB TESTING PROTOCOL

PROCEDURE/POLICY NO.: CHE/CKMB.MAN

PREPARED: J. Stout DATE PREPARED: 10/25/93 DATE ADOPTED: 10/25/93

INTRODUCTION:

The CKMB procedure used on the DuPont Dimension AR is noted by the company to be the best utilized as a screening technique for the presence of the creatine kinase MB isoenzyme activity in serum. Interference is a common problem using this technology for CKMB testing and this policy is written to define what criteria to use in reporting and in follow-up of abnormal results.

SPECIMEN REQUIREMENTS:

1. Serum specimens are required. Blood collection tubes containing EDTA, lithium heparin, sodium fluoride or potassium oxalate should not be used. Corvac and SST collection tubes do not affect the CKMB method.
2. Hemolysis will cause a false elevation of CKMB results and hemolyzed specimens should not be used.

CAUTION: BIOHAZARD PRECAUTIONS MUST BE FOLLOWED WHEN DOING CKMB TESTING.

PROCEDURE:

A total CK level should be run with each CKMB level. If the total CK is normal and the CKMB result is abnormally high the results are suspicious of interference. When this occurs please use the following testing algorithm.

TESTING ALGORITHM:

If the CKMB result is:

1. 0-13 mg/dl.....report DuPont Dimension AR result.
2. = or > 14 mg/dl.....check total CK on DuPont AR.

If the total CK result is:

1. >232 U/L.....report AR result for CKMB.
2. = to or < 232 U/L.....repeat CKMB on Stratus.

If the Stratus CKMB result is:

1. < or = 4.7 ng/ml.....report "See Text" and enter Stratus results and normals,
i.e.: "CKMB by alternate method = ____"
"Normals < 4.7 ng/ml."
2. > 4.7 ng/ml.....Electrophoresis. Result with "SEE" and coded comment "Referred to pathologist, additional report to follow if indicated". Also add in procedure free text that the total CK is normal but the CKMB shows interference by routine and alternate methods.

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