DEPRESSION AND CORONARY HEART DISEASE:

IMPROVING PATIENT OUTCOMES

IN OUTPATIENT CARDIOLOGY PRACTICE

by

Mary Beth Lochner

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SIGNED: Mary Beth Lochner
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5. Skipping dinner when I couldn’t
6. Cleaning the house when I couldn’t
7. Keeping me company by snoring when I couldn’t

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And to my sisters, Harriet Elizabeth and Rebecca Ann to which I will be forever bonded; Daddy and Mama are very proud of us …… I love you all.
DEDICATION

I dedicate this special journey to my parents Albert and Esther Converse for without their unfailing love, guidance, and modeling of how to live a full and happy life, I would not be who I am today. The fine examples of nursing provided to me by my mother Esther Guinn Converse RN (retired) and my aunt Alice Guinn Williams RN, Nurse Anesthetist (retired) have consistently been a joyous source of inspiration in my career; for that I am blessed.

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ABSTRACT

Strong evidence has been found to link the diagnosis of CHD with depression, and patients with all CHD-related diagnoses and co-morbid depression display higher morbidity and mortality from CHD than those individuals without depression. Screening and treatment of depression by cardiology clinicians continues to be limited due to poor symptom recognition and lack of desire to treat perceived primary care conditions in specialty practice. The American Heart Association has designated timely assessment and treatment/referral of depression as primary goals for high-quality evidenced-based cardiology care to improve patient outcomes in CHD.

This study employed a quasi-experimental descriptive pretest-posttest study design for the purposes of (1) understanding diagnostic and treatment practices for depression in the presence of CHD by nurse practitioner and physician cardiology providers (n=35) in a large metropolitan private outpatient cardiology practice and; (2) adaptation of a valid and reliable depression screening tool (Patient Health Questionnaire-9) to an existing electronic medical record system for use in the sample practice.

Findings from the study showed that even though all providers (100%) believed that depression inhibited patients’ ability to make positive CHD risk-reducing lifestyle changes, and the majority (73.7%) felt that depression contributed to the progression of CHD, no formal screening for depression was being performed. Less than half (42.1%) of providers in the sample treated depression in their clinic practice, and the large majority (89.5%) referred patients back to primary providers for all depression care.
Since 2008 guidelines for depression care by cardiology providers were recommended by the American Heart Association (endorsed by the American Psychiatric Association), it is questionable if these recommendations are filtering down to outpatient cardiology practice. Provider education to improve confidence with depression screening and treatment, and provision of concise easy-to-use care templates in outpatient EMR systems may help to improve compliance with recommendations while maximizing patient outcomes for depressed CHD patients.

Advanced practice nurses have been consistently instrumental in the development and management of performance-enhancing processes that improve care quality and patient outcomes. As nursing practice leaders, nurse practitioners should be progressive in supporting implementation of best-practice for depression care in outpatient cardiology practice settings.
CHAPTER I
INTRODUCTION

Background

In his lecture before the Royal College of Physicians of London in 1888, William Mickle (1888) noted that “The internal organs are plainly not the agents of their special functions only, but by reason of the intimate consent or sympathy of functions, they are essential constituents of our mental life”. He went on to note that the relationships between mental health and heart disease were evident, but poorly understood. Since 1888, thousands of research inquiries and reports have been written on the subject of coronary heart disease (CHD) and its relationship to depression, but little advancement has reportedly been made with regard to routine diagnostic screening and treatment of depression in the presence of CHD in outpatient cardiology practice.

Strong evidence has been found to link the presence of CHD with Major Depressive Disorder (MDD) (Camus, Kraehenbuhl, Preisig, Bula, & Waeber, 2004; Glassman & Shapiro, 1998; Hemingway & Marmot, 1999; Herbst, Pietzak, Wagner, White, & Petry, 2007; Lichtman et al., 2008; Malik et al., 2005; Musselman, Evans, & Nemeroff, 1998; Rozanski, Blumenthal, & Kaplan, 1999). Numerous researchers have also reported that individuals with varying CHD-related diagnoses and depression display higher morbidity and mortality related to their cardiovascular disease than those individuals without evidence of depression (Rugulies, 2002). One out of every three patients with a diagnosis of CHD as a result of recent MI (myocardial infarction) or acute coronary syndrome (ACS), and those individuals with congestive heart failure (CHF)
display symptoms consistent with Dysthymic Disorder (dysthymia) or MDD (Gehi, Haas, Pipkin & Whooley, 2005; Jiang, Glassman, Krishnan, O’Connor, & Califf, 2005; Whooley, 2006). In a meta-analysis completed by Rutledge, Reis, Linke, Greenberg, & Mills (2006), one out of every five CHF patients were found to have symptoms consistent with MDD.

Other studies have linked specific cardiac events such as acute MI (Thombs et al., 2006), coronary artery bypass graft (CABG) procedures (Malik et al., 2005) with bypass pump exposure (Szalma et al., 2006), and implantable cardioverter defibrillator (ICD) for ischemic cardiomyopathy (Bilge et al., 2006) to increased risk for dysthymia and MDD. The presence of all CHD morbidities combined with coexisting depression disorders are consistently related to poorer outcomes in the treatment of heart disease (Lichtman, et al., 2008).

**Statement of the Problem**

**Prevalence and Populations at Risk**

Currently, 30.9% of all persons over the age of 65 in the United States (US) are living with some form of CHD. This age group constitutes the largest segment of the population that presents with CHD (CDC, 2008). Twenty to 30% of older adults with CHD will experience a MDD (Ariyo, et al., 2000; Jaing, at al., 2001; Ziegelstein et al., 2000) and the incidence and prevalence of depression further doubles in those individuals ages 70-85 (Alexopoulos, 2005).

In addition to physiologic changes occurring in older adults with CHD, psychological changes present with aging that vary according to each individual’s unique
life experiences and behavioral makeup. These psychological changes that revolve around internal and external stressors surrounding illness, assuming new caregiver roles, loss of independence, and loss of loved ones (Ham, 2002) can further increase the risk of depression in older adults. As a maladaptive response to stressors, older adults who present with MDD or dysthymia often minimize individual concerns about their depressive symptoms because of learned sociocultural patterns of beliefs regarding mental illness (Karel, Ogland-Hand, & Gatz, 2002). These maladaptive behavior patterns frequently impact case-finding in outpatient cardiology practice.

Older adults with MDD often display functional activity impairment such as changes in regular activities of daily living, increased fatigue, altered sleep patterns, and excessive or decreased food consumption; all which can significantly impact cardiac health through decreased exercise, increased weight gain, or cachexia (Bruce, Seeman, Merrill, & Blazer, 1994; Karel et al., 2002; Ziegelstein et al., 2000). Untreated depression and dysthymia have also been directly related to poor participation in cardiac rehabilitation programs (Ades, Waldmann, McCann, & Weaver, 1992; Glazer, Emery, Frid, & Banyasz, 2002) which can further impair overall health and wellbeing for CHD patients.

Poor compliance with medication therapy and treatment regimens for CHD (in the presence of depression) resulting in adversely impacted cardiac health has been well-documented in the literature (Carney, Freedland, Miller, & Jaffe, 2002; DiMatteo, Lepper, & Croghan, 2000; Gehi et al., 2005; Karel et al., 2002; Lett et al., 2004; Rieckmann et al., 2006). Rieckmann et al. (2006) found that overall medication
adherence in patients with ACS was decreased by 15% in the presence of dysthymia and 22% in those with MDD; and DiMatteo et al. (2000) reported that patients with CHD had three times the risk of poor treatment compliance in the presence of depression.

Symptoms of major depression are often manifested in sub clinical and generalized anxiety (Frasure-Smith & Lesperance, 2008; Strik, Denollett, Lousberg, & Honig, 2003) and/or varying somatic complaints in older adults. Symptoms such as muscle aches, headaches, irritability, palpitations, or changes in bowel and bladder habits that are often attributed to physical morbidity in outpatient cardiology practice are often overlooked as possible symptoms of depressive disorders (Karel et al., 2002; Grohol, 2008).

Multiple studies have shown that depressed CHD patients have increased health care utilization and greater economic burden as compared to non-depressed patients (Frasure-Smith et al., 2000; Stein, Cox, Afifi, Belik, & Sareen, 2006). In a meta-analysis investigation, Rutledge et al., (2006) also reported further evidence of increased health care interventions and expenditures in those cardiac patients with depression.

Limitations in Current Depression Treatment in Cardiology Practice

The presence of all CHD morbidity along with coexisting depression is consistently related to poorer outcomes in the treatment of heart disease (Lichtman et al., 2008). This finding has been well documented in large studies such as the SADHART-CHF trial (n = 500) (Jiang et al., 2005) and the prospective HEART and SOUL trial (n = 1,024) (McManus, Pipkin, & Whooley, 2005). Because older adults with depression are
at higher risk for developing CHD (Ariyo et al., 2000), the likelihood of caring for these patients is increased in cardiology practice.

In 2008, The American Heart Association (AHA) published a science advisory to provide recommendations for screening, referral, and treatment of depression in coronary heart disease patients (Lichtman et al., 2008) that was supported by the AHA Committee of the Council on Cardiovascular Nursing, Council on Epidemiology and Prevention, and the Interdisciplinary Council on Quality of Care and Outcomes Research. This science advisory validated the continued concerns that untreated or poorly treated depression is directly related to:

1. Decreased medication and treatment compliance.
2. Decreased success with adherence to programs that modify CHD risk factors (exercise, weight management, and stress reduction).
2. Decreased participation in cardiac rehabilitation programs.
3. Increased healthcare utilization costs.
4. Considerably decreased quality of life.

The treatment of depression by cardiology clinicians continues to be limited due to lack of initial symptom recognition, misattribution of symptoms in medically complex CHD patients (Feinstein, Blumenfield, Orlowski, Frishman, & Ovanessian, 2006; Karel et al., 2002), and lack of desire to treat perceived primary care conditions in specialty practice (cardiologist personal communication, July 14, 2010). The 2008 AHA science advisory (Lichtman et al., 2008) designated the assessment and treatment/referral of depression as primary goals for high-quality evidenced-based cardiology care to improve
overall patient outcomes in CHD and quality of life. Improving awareness of risk factors for depression in outpatient cardiology settings and implementing care strategies that incorporate assumptions and propositions of aging theory support a quality plan of care for CHD patients.

Significance to Advanced Practice Nursing

CHD is a major infirmity in older adult populations. A positive diagnosis of CHD often coexists with underlying depression. In recent years, researchers have noted that individuals with varying CHD-related diagnoses and depression display higher morbidity and mortality related to their cardiovascular disease. Doctorally prepared advance practice nurses have an opportunity to effectively meet the needs of this vulnerable population through comprehensive screening, clinical decision making, effective interventional treatment, evaluation of care to improve patient outcomes, and education of physician co-workers and staff with regard to implementing effective programs for treating depression in CHD patients.

Purpose

The purposes of this practice inquiry were to determine current treatment practices by nurse practitioners and physicians for screening and treating at-risk patients with CHD who present with MDD or dysthymia in outpatient cardiology practice clinics; and to adapt a reliable and valid (Patient Health Questionnaire-9) depression screening tool for use in outpatient cardiology clinics.
Specific Aims are to:

1. Describe current outpatient care of depression in the presence of CHD, provided by a defined cardiology practice through the administration of the *Survey 1 of Depression Treatment in Outpatient Cardiology Practice* tool to a convenience sample of nurse practitioners and physicians.

2. Adapt the Patient Health Questionaire-9 depression screening tool to the electronic medical record to be made available to all cardiology providers in the sample population over a designated period of time.

3. Evaluate the effectiveness of exposure to a depression screening tool in the sample population by administering the *Survey 2 of Depression Treatment in Outpatient Cardiology Practice* tool after a designated period of time.

Definitions

1. CHD is defined as “a narrowing of the small blood vessels that supply blood and oxygen to the heart” (U.S. National Library of Medicine, 2010) and is synonymous with coronary artery disease (CAD). Potential sequelae resulting from the ischemic burden of CHD include ACS/MI, CHF, cardiomyopathy, electrical conduction disturbances, and heart valve failure. Treatments for these sequelae often include percutaneous coronary intervention (PCI), CABG, heart valve replacement, or placement of pacemakers and ICDs (U. S National Library of Medicine, 2010).

2. MDD is defined as a compilation of five or more symptoms (listed in Table 1) which have been noted within a 2-week period that deviate from normal behavior for an
individual. At least one of the symptoms must include loss of interest or depressed mood (American Psychiatric Association, 1994; Office of the Surgeon General, 1999).

Table 1. *Symptoms of Major Depressive Disorder*

| a. | Depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad or empty) or observation made by others (e.g., appears tearful). |
| b. | Markedly diminished interest or pleasure in all, or almost all activities most of the day, nearly every day (anhedonia) (as indicated by either subjective accounts or observation made by others). |
| c. | Significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day. |
| d. | Insomnia or hypersomnia nearly every day. |
| e. | Psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings or restlessness or being slowed down). |
| f. | Fatigue or loss of energy nearly every day. |
| g. | Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick). |
| h. | Diminished ability to think or concentrate, or indecisiveness, nearly every day (either subjective account or as observed by others). |
| i. | Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide. |

In order for a diagnosis of MDD to be made, the symptoms must cause clinically significant dysfunction in one or more important areas of daily living (e.g., at work, in social surroundings, or with family interactions). Symptoms must not be related to medication side effects, drug or alcohol abuse, metabolic dysfunction such as thyroid disease, or the grief state. Depressive symptoms lasting longer than two months or symptoms that produce significant suicidal ideation, flat affect with catatonic response, obsessive fascination with worthlessness or significant functional impairment must be

3. Dysthymic Disorder is the formal name for dysthymia and is currently defined as a pervasive depressed mood on most days for a minimum of two years. Individuals either report subjective symptoms, or depressive behavior is noted by other individuals in close contact. Criteria for diagnosis of Dysthymic Disorder are included in Table 2 (American Psychiatric Association, 1994; Office of the Surgeon General, 1999).

Table 2. Symptoms of Dysthymic Disorder

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<th>a. Presence of two or more of the following reported behaviors; (1) poor appetite or overeating (2) insomnia or hypersomnia (3) low energy or fatigue (4) low self-esteem (5) poor concentration or difficulty making decisions (6) feelings of hopelessness.</th>
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<td>b. During the 2-year period, individual has not been without symptoms noted in (a) for more than two months at a time.</td>
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<tr>
<td>c. No major depressive disorder has occurred in the past two years.</td>
</tr>
<tr>
<td>d. The occurrence of symptoms does not occur in conjunction with a chronic psychotic disorder such as schizophrenia.</td>
</tr>
<tr>
<td>The symptoms are not directly related to substance abuse or a metabolic dysfunction.</td>
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<td>Symptoms cause clinically significant impairment in daily functioning.</td>
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The Diagnostic and Statistical Manual of Mental Disorders fourth edition (DSM-IV) criteria for Dysthymic Disorder are currently under revision in preparation for the new mental health diagnostic guidelines to be published in the DSM-V manual. The term “Chronic Depressive Disorder” is under consideration. The new guidelines will likely allow for the occurrence of a major depressive episode in the criteria (American Psychiatric Association, 2010a).
Summary

The importance of developing a comprehensive evidenced-based plan of care to treat depression in outpatient cardiology practice is strongly supported by research findings in multiple fields of study and practice (nursing, psychology, psychiatry, cardiology, aging studies, pharmacology, public health, and molecular biology). This practice inquiry seeks to evaluate current depression screening and treatment practices in a defined cardiology practice setting, and provide a screening strategy for improving outcomes for CHD patients with depression who present to outpatient cardiology clinics.
CHAPTER II

CONCEPTUAL FRAMEWORK AND REVIEW OF THE LITERATURE

Conceptual Framework for the Practice Inquiry

The Continuity Theory of Aging

The Continuity Theory of Aging (adapted from studies of aging in middle and older adulthood) posits that aging is not solely a homeostatic process in which certain behaviors (activities) lead to life satisfaction, but a multidimensional interactional relationship between past, present, and future experiences that is used by individuals to select patterns of living as they age (Kaufman, 1986). This construct is adapted from systems feedback theory which states that initial patterns of interactions with the environment influence the choices made by individuals which in turn affects future choices and interactions with the environment (Buckley, 1967).

The goal of continuity theory is not to predict successful aging or determine outcomes of adaptation, but to understand the constancy of individual patterns of adaptation in aging. The expected outcome of continuity theory is that individuals will use personalized patterns formulated over a lifetime of experiences to adapt to changes with aging (Atchley, 1999).

As individuals age, they require both continuity and change to meet life’s challenges. Adults are often prompted to use well-established patterns to adapt to changes in aging. Continuity theory incorporates the study of these individualized patterns in aging that show longitudinal consistency over time as well as pattern observation for detectable change. Unique patterns of aging either exhibit linear
continuity or sloping discontinuity depending on the overall maintenance of those patterns. Significant deviation from normal patterns of aging as in the case of exposure to sudden or extreme morbidity promotes discontinuity (Atchley, 1999). Maladaptation occurs when the forces of continuity are rigorously enforced by individuals thus preventing assimilation of new life changes (Lieberman & Tobin, 1983).

Older adults who present with CHD and depression display discontinuity. Their primary constructs of self, relationships with others, and personal lifestyles have been impacted by a change in physical and behavioral health related to their disease process. Internal and external frameworks that were previously successful are no longer useful as aids in maintaining adaptive capacities. Adaptive strategies have failed and maladaptation has occurred (Atchley, 1999). By applying the postulates of the Continuity Theory of Aging to the development of effective outpatient care strategies for the treatment of MDD and dysthymia in the presence of CHD, cardiology clinicians can enhance positive adaptation in aging and further improve outcomes of care.

**Review of the Literature**

The following sections will describe the multifaceted relationships between CHD and depression. In addition, the researcher will briefly discuss the influences of aging on the development of MDD/dysthymia in the presence of CHD. Proposed pathophysiologic causes for depression with CHD and occurrence of depression in specific CHD-related morbidities will be reviewed. Lack of current focus on treatment of MDD and dysthymia in outpatient cardiology practice will also be examined as well as suggested treatments for improving patient outcomes.
Literature Search Strategy

An extensive literature search was completed using a comprehensive clinical evidence-based medicine (EBM) search engine affiliated with the Arizona Health Sciences Center Medical Library at The University of Arizona. The EBM search engine was developed to systematically search for the highest and most widely used levels of evidence using ranking standards set forth by the Oxford Center for Evidenced-Based Medicine – Levels of Evidence (Arizona Health Sciences Library, 2010). Key words entered in the search were “coronary heart disease” and “depression” which resulted in 6092 references. Further defined searches using the keywords “outpatient practice”, “barriers to”, “treatment of”, “nurse practitioners”, “cardiologists”, and “depression” yielded another 166 references.

Of the original 6258 references, 686 references were selected for review. Fifty-four references directly related to older adults and depression (with or without CHD). Seventy-six references highlighted CABG surgical intervention in the title, 74 references discussed depression in relation to MI or ACS, six referred to ICDs, and two discussed the relationship of depression to heart valve replacement. Eighty-two references discussed possible pathophysiologic pathways for the development of depression related to CHD.

Pathophysiology of Depression in CHD.

Multifactorial biologic and pathophysiologic mechanisms have been brought forth as possible causes of depression related to CHD. These mechanisms include:

1. Enhanced thrombocyte activation through release of platelet activation products in
depressed patients with ischemic heart disease (Markovitz & Matthews, 1991)

2. Impaired vascular endothelial function (Sherwood, Hinderliter, Watkins, Waugh, & Blumenthal, 2005).

3. Increasing inflammatory biomarkers in the presence of depression which promote CHD
   (Ridker, Hennekens, Buring, & Rifai, 2000).

4. Dysregulation in the hypothalamic-pituitary-adrenal axis (Taylor et al., 2006).

5. Possible polymorphisms in the short (s) allele of the promoter region of the serotonin transporter gene (5-HTTLPR) which can affect cardiac reactivity and promote depressogenic responses (Kangelaris, et al., 2010).

6. Low heart rate variability (HRV) after an acute coronary event caused by increased sympathetic tone or decreased parasympathetic tone (Carney et al., 2001).

**Platelet Dysregulation**

Hypercoaguvalbe states are well known to promote the development of CHD through the production of prolonged deposition of clot-forming fibrin particles within arterial plaques (Davies, 1996). In multiple trials, platelet dysfunction has been associated with increased negative outcomes with regard to CHD in those individuals with depressive disorders (Glassman et al., 2002; Lahlou-Laforet et al., 2006; Musselman et al., 1996; Pollock, Laghrissi-Thode, & Wagner, 2000; Serebruany et al., 2003b). Although, data from two studies (Gehi et al., 2010; Schroeder et al., 2007) showed no relationship between depression and thrombocyte activation in stable CHD patients.
Platelet function is a primary factor in the development of thrombus formation in damaged endothelial vascular beds. The activation of platelets is promoted by a complex cascade that includes platelet factor 4, β-thromboglobulin, and serotonin which cohesively interact in the formation of clots (Nemeroff & Musselman, 2000). When released by platelets, serotonin acts as a weak platelet agonist by modulating 5-HT2 receptors to promote vasoconstriction and thrombus formation (Musselman, Evans, & Nemeroff, 1998). After administration of selective serotonin reuptake inhibitors (SSRIs), plasma serotonin levels were noted to decrease as drug levels increased and depression symptoms improved, which could negatively impact thrombus formation (Blardi et al., 2002; Hergovich et al., 2000; Leo, et al., 2006; Markovitz & Shuster, 2000; Musselman et al., 2000; Pollock et al., 2000; Serebruany, O’Connor, & Grubel, 2001; Glassman, et al., 2002).

Additional studies showed that an increase in 5-HT2 binding density and decrease in available serotonin transporter sites occurred in the presence of untreated depression which enhanced the thromboembolic cascade toward clot formation and atherogenesis (Arora & Meltzer, 1989; Biegon, et al., 1990; Biegon et al., 1987; Musselman et al., 2000). Serebruany et al. (2001) further suggested that SSRIs may inhibit platelet function in a different pathway than is seen by the glycoprotein IIb/IIIa inhibitors (abciximab, eptifibatide, tirofiban) and antioxidants such as coenzyme Q10, which could further improve CHD-related antiplatelet treatment. Findings from the Sertraline Antidepressant Heart Attack Randomized Trial (SADHART) Platelet Substudy validated this hypothesis by showing that treatment with the SSRI, sertraline, was indeed
associated with decreased activation of certain platelet biomarkers (β-thromboglobulin, P-selectin, and E-selectin) as compared to placebo over a 16-week trial of therapy for depression (Serebruany et al., 2003a).

It is important however, to note that the findings reported in multiple studies on the relationship of platelet function to depression and CHD have been mixed and have not demonstrated conclusively that there is a clear relationship between SSRI therapy and decreased platelet activation. Wittstein (2010) suggested that the variability in the findings in these studies may have been related to methodological differences in the study designs or unique physiologic differences among patient populations.

**Endothelial Dysfunction**

The vascular endothelium is the first layer of endothelial cells lining the interior surface of the vessels in the circulatory system (Bonetti, Lerman, & Lerman, 2003). The endothelium is in a constant state of repair in response to chemical and mechanical damage. Endothelial progenitor cells (EPCs) that originate in the bone marrow act as biologic substrates to repair this vascular damage and facilitate the return of normal endothelial function (Gulati et al., 2003).

Postulated theories for endothelial dysfunction are based on the idea that a deficiency of EPCs along with decrease in nitric oxide (NO) activity initially impairs endothelial function. Subsequent interactions between an impaired intravascular anticoagulation response and decreased vasodilatory function may further enhance the development of atherogenesis (Aicher et al., 2003; Bonetti, Lerman, & Lerman, 2003). The release of NO is mitigated by shear stress over healthy endothelial cells in the
vascular lumen that occurs in response to variable changes in blood flow. With endothelial dysfunction, a decrease in NO activity is observed which increases vasoconstriction (endothelin, thromboxan, phospholipase-A2 and reactive oxygen species), platelet aggregation (plasminogen activator inhibitor-1, tissue plasminogen activator, von Willebrand factor, and thrombomodulin), monocyte adhesion (vascular adhesion molecule-1, inter-cellular adhesion molecule-1, E selectin, and P selectin), and oxidation of low density lipoproteins (Hirata et al., 2010).

Multiple studies have extensively documented the relationship of endothelial dysfunction to CHD (Ganz & Vita, 2003; Lerman & Zeiher, 2005; Widlansky, Gokce, Keaney, & Vita, 2003). Individuals who present with endothelial dysfunction have three to four times the risk of sustaining a CHD event as compared to those individuals who have normal endothelial function (Lerman & Zeiher, 2005). However, few studies have been undertaken to explore the relationship of endothelial dysfunction to CHD in the presence of depression.

The most recent study (Lavoie, Pelletier, Arsenault, Dupuis, & Bacon, 2010) used a population of patients (referred for myocardial perfusion imaging who were suspect to have CHD) was undertaken to “assess the associations between clinically significant depression (MDD) and/or minor depressive disorder (MiDD) and endothelial function assessed via forearm hyperemic reactivity” (Lavoie et al., 2010). Only one other study (Sherwood et al., 2005) had addressed the possible relationship of endothelial dysfunction to CHD in the presence of depression. However, Sherwood's study was
limited by a lack of clear distinction between the two levels of depression, and whether there was a difference in endothelial function related to depression and CHD.

Lavioe's study (Lavioe et al., 2010) showed a clear relationship between increasing endothelial dysfunction and depression, although there was no significant dose-response relationship between impaired endothelial function and levels of depression. These findings were noted irrespective of clinically diagnosed CHD and showed that endothelial dysfunction may only be important to CHD as depression worsens.

**Inflammatory Biomarkers in Depression and CHD**

The development of atherogenesis is complex in nature and involves multiple immunologic factors that interact to promote the development of CHD. Although numerous studies have used a variety of inflammatory markers to detect inflammation (Glassman, 2007), elevations in the levels of C-reactive protein (CRP), tumor necrosis factor (TNF), and interleukin-6 (IL-6) have been found to be most consistent in the literature with regard to predicting new onset or recurrent CHD (Cesari et al., 2003; Danesh, Collins, & Peto, 1997; Ridker et al., 2000a; Ridker, Rifai, Stampfer, & Hennekens, 2000b).

CRP, a serologic protein marker of systemic inflammation, is synthesized in the liver and is released in response to a rise in plasma levels of IL-6 and TNF produced by macrophage cells. The primary function of CRP is to assist in phagocytosis and complement binding in response to damaged or foreign cells (Pepys & Hirschfield, 2003).
IL-6 is released by macrophages and T-cells in response to acute insults by pathogens, trauma, or foreign cell structures. This cytokine is responsible for the febrile response that accompanies illness (Heinrich, Castell, & Andus, 1990). The release of IL-6 in the immune pathway is thought to be important for signaling a cascade of cellular reactions in the development of atherogenesis (Ross, 1999; Schieffer, 2003) and depression (Dowlati et al., 2010).

TNF (also in the cytokine family and released by monocytes and other immune cells) is directly involved in the acute phase of the immune response, in conjunction with IL-6. The primary function of TNF is to regulate cells in the immune system involved with the inflammatory response and apoptosis. The release of TNF also increases serum CRP; and acts to inhibit viral replication and tumorigenesis that are often precursors to disease (Locksley, Killeen, & Lenardo, 2001). Higher levels of TNF can cause depression-related symptoms of anhedonia, fatigue, anorexia, and cachexia (Grippo, Francis, Weiss, Felder, & Johnson, 2002), and have been closely associated with heart failure caused by CHD (Levine, Klamann, Mayer, Fillit, & Packer, 1990).

Elevations in CRP and IL-6 are also found to be strongly associated with depression (Miller, Freedland, Carney, Stetler, & Banks, 2003). Findings from the Cardiovascular Health Study (Kop et al., 2002) also showed that depression was significantly associated with elevations in CRP after adjusting for multiple factors (gender, age, race, weight, height, systolic blood pressure, smoking history, and diabetes). Results from The Third National Health and Nutrition Examination Survey
further noted that a lifetime history of depression was clearly associated with higher CRP levels (Ford & Erlinger, 2003).

Although the relationship between elevated inflammatory markers and depression in the presence of CHD has been documented in previous studies (Frasure-Smith et al., 2007; Lanquillon, Krieg, Bening-Abu-Shach, & Vedder, 2000; Mikova Yakimova, Bossmans, Kenis, & Maes, 2001; Schins et al., 2005), findings from the well-designed Heart and Soul Study showed that depression was not clearly associated with increased inflammatory markers, and that levels of CRP and IL-6 were actually lower in depressed versus non-depressed subjects with stable CHD (Whooley et al., 2007). Investigators in the Heart and Soul Study proposed that variations in inflammation could be caused by a ceiling effect in the presence of chronic or stable CHD that would preclude any further inflammatory response. In reference to these results, Hannestad (2008) suggested that the use of statin therapy (Lesperance, Frasure-Smith, Theroux, & Irwin, 2004) and antidepressant therapy (O'Brien, Scott, & Dinan, 2006) by a large percentage of the study subjects in the Heart and Soul trial could have influenced the study findings due to specific medication-related anti-inflammatory mechanisms of action.

A 2009 study continued to show the overall relationship of increased CRP levels in stable CHD patients with depression (Bankier, Barajas, Martinez-Rumayor, & Januzzi, 2009) however, Bjerkeset, Romild, Smith, Smith, & Hveem (2010) recently noted that this relationship held only with older adults who have had an MI and co-morbid depression. Further studies are required to determine conclusive relationships between inflammation, CHD, and depression.
Dysregulation of the Hypothalamic-pituitary-adrenal Axis

Alterations in the hypothalamic pituitary-adrenal (HPA) axis in persons with depression have been found to contribute to chronic inflammation in coronary vessels (Libby & Theroux, 2005; Taylor et al., 2006). Through a series of complex hormonal processes in the hypothalamus, the release of cortisol from the adrenal cortex is stimulated by the effect of corticotropin-releasing hormone (CRH) action on adrenocorticotropin (ACTH) in the pituitary gland. CRH neurons in the brain regulate the autonomic nervous system through adrenal innervation and affect mood regulation. Centrally released CRH and cortisol from the adrenal cortex are primary contributors to symptoms associated with depressed states (Bao, Meynen, & Swaab, 2008).

Prolonged activation of the HPA axis is believed to be strongly correlated with an increased risk for depression because of burdens associated with elevated physiologic stress mechanisms that are present in this state (Bao et al., 2008). Bao et al. (2008) further described the CRH-hypothesis of depression in which increases in cerebral concentrations of CRH (related to hyperactivity of CRH neurons) are the causative mechanisms of HPA axis dysregulation and subsequent induction of depressive symptoms.

HPA axis dysregulation/hyperactivity has also been found to be related to the CRHR1 gene. The presence of this gene in certain individuals can lead to activation or worsening of depressed states in conjunction with exposure to stressful life events (Liu et al., 2006; Wasserman, Sokolowski, Rozanov, & Wasserman, 2008).
HPA axis dysregulation has been shown to return to normal functioning with successful depression treatment (Nemeroff, 1998). However, there is also evidence that hypercortisolemic states persist between acute depressive episodes in individuals prone to dysthymic or chronic depression (Harris et al., 2000; Weber-Hamann et al., 2006; Young, Aggen, Prescott, & Kendler, 2000). Possible treatments in the future may also include the addition of CHR-receptor antagonists (Grammatopoulos & Chrousos, 2002; Keck & Holsboer, 2001).

HPA axis dysregulation has been postulated in the pathogenesis of CHD. Increased circulating levels of cortisol lead to alterations in systolic blood pressure (SBP), elevated heart rate, central adiposity, dyslipidemia, and type II diabetes which are all risk factors for CHD (Miller, Stetler, Carney, Freedland, & Banks, 2002. Rosmond and Bjorntorp (2000) further agreed that central obesity due to HPA axis dysregulation was an important factor in the progression of CHD.

In summary, the relationships between HPA axis dysregulation, CHD, and depression appear to be circular, but somewhat inconclusive. Interactions between neuroendocrine modulators noted in all three morbidities appear to contribute to the relationship.

Serotonin Transporter Gene Variants in CHD and Depression

The serotonin transporter gene (SLC6A4) has been identified as a candidate gene for predicting depression in populations. This gene promotes serotonergic transmission at the cellular level and influences the protein that is the central focus of antidepressant medication therapy (Cervilla et al., 2006). A common functional polymorphism in the
SLC6A4 gene involves the presence of a dominant short \((s)\) allele in the serotonin transporter length polymorphic region (5-HTTLPR) of the gene instead of a recessive longer \((l)\) allele. The short \((s)\) allele is associated with decreased production of serotonin transporter molecules whereas the longer \((l)\) allele is related to an increased production of serotonin transporter molecules (Heils et al., 1996).

The decreased transcription of the serotonin transporter gene in the \((s)\) allele has been associated with increased individual risk for subclinical depression and MDD with no history of CHD (Gonda, Juhasz, Laszik, Rihmer, & Bagdy, 2005; Kendler, Kuhn, Vittum, Prescott, & Riley, 2005), and with a positive history of CHD (Otte, McCaffery, Ali, & Whooley, 2007). Limited response to SSRI therapy (Smeraldi et al., 1998), decreased adaptation to environmental life stressors (Uher & McGuffin, 2008), and increased cardiac reactivity (McCaffery, Biell, Pogue-Gelle, Ferrell, & Manuck, 2003) have also been found to be associated with this polymorphism.

Recently, Kangelaris et al. (2010) found that (in their sample of 870 subjects with stable CHD) 32% of the sample were homozygous \((ll)\) genotype, 48% carried a heterozygous \((ls)\) genotype, and 20% were homozygous \((ss)\). African Americans displayed the lowest number of \((s)\) allele genotypes and Asians, the highest. Males displayed the highest incidence of dose-dependant depressive symptoms in proportion to the number of \((s)\) alleles present on individual genotypes. In relation to CHD, the presence of homozygous \((ss)\) genotypes may be a strong indicator of depression risk in individual CHD patients, especially in higher risk Caucasian males.
Heart Rate Variability

HRV is an electrocardiographic marker of minute variations in the dynamic heart rate and RR intervals of a normal sinus depolarization; and is a marker of the effect of the autonomic nervous system (ANS) on cardiac regulation. Normal HRV in a healthy heart will maintain balanced slightly chaotic sympathetic and parasympathetic regulation in response to stress or rest. In the heart that has undergone an ischemic event from CHD, the balance of sympathovagal stimulation will be blunted resulting in decreased HRV (Dantest, 2010).

The relationship between decreased HRV in patients with CHD and co-morbid depression has been well documented in multiple studies (Bigger et al., 1992; Carney, Freedland, Rich, & Jaffé, 1995; Carney, Freedland, & Veith, 2005; Stein et al., 2000). This relationship is thought to exist because of the influences of neurohormonal dysregulation in the ANS. Increased sympathetic and decreased parasympathetic activity are hallmarks of ANS dysregulation and produce variability in cardiac autonomic tone that can precipitate the progression of CHD morbidity (ischemia and ventricular arrhythmias) and lower the threshold for mortality (Carney et al., 1995; Carney et al., 2005; Glassman & Shapiro, 1998; Kop, Stein, Barzilay, Tracy, & Gottdiner, 2008).

Dysregulation in cardiac tone as a response to decreased parasympathetic and excessive sympathetic activity has been well-documented in the general depression literature (Barnes et al., 1983; Lake et al., 1982; Veith et al., 1994; Wyatt, Portnoy, Kupfer, Snyder, & Engelman, 1971) and CHD literature (Carney et al., 1995; Carney et al., 2002; Glassman & Shapiro, 1998; Kleiger, Miller, Bigger, & Moss, 1987). Decreased
HRV as a result of dysregulation in cardiac autonomic tone has also been reported in depressed post-MI patients as well as those patients with stable CHD (cardiac event-free for a minimum of six months).

Stein et al. (2000) found that 47% of depressed patients in their study had evidence of decreased HRV as compared to 13% in a similar non-depressed group; and that decreased HRV increased the overall relative risk of mortality. Carney et al. (2001) noted similar findings in post-MI patients (16% of depressed as compared to 7% of non-depressed). Guinjoan et al. (2004) also noted that as depressive symptoms increased, HRV decreased in their sample of older adults with CHD. These findings comprise a large body of work on the study of autonomic dysfunction, depression, and CHD as interrelated components for consideration in the treatment of depression in the presence of CHD.

**Incidence of Depression in Specific CHD Morbidities**

**Acute Coronary Syndrome and Myocardial Infarction**

MI is defined as a “detection of rise or fall of serum cardiac biomarkers (preferably troponin) with at least one value above the 99th percentile of the upper reference together with evidence of myocardial ischemia” (Thygesen, Alpert, & White, 2007). These parameters must be accompanied by at least one of the following: new electrocardiograph (ECG) changes that represent ischemia, newly documented pathologic Q-waves on ECG, evidence of recent loss of viable myocardium or regional heart wall motion dysfunction on myocardial perfusion imaging study, or patient-reported symptoms of ischemia (Thygesen et al., 2007). ACS encompasses a range of symptoms
that are associated with myocardial ischemia and can lead to acute MI. This compilation of symptoms can include non-ST segment elevation MI, non-Q-wave elevation MI, and unstable angina (American Heart Association, 2010).

One in three patients will develop MDD within 12 months after an MI (Lesperance, Frasure-Smith, & Talajic, 1996), and those who experience depression have a four-fold relative risk (after adjusting for other factors) of mortality within six months after an initial MI (Frasure-Smith, Lesperance, & Talajic, 1993). Kronish et al. (2006) also found that patients who experience an ACS event and remain persistently depressed in the three months post-MI have a higher risk of not adhering to recommended lifestyle modifications that support cardiac health (smoking cessation, taking medications regularly, regular exercise, and completion of cardiac rehabilitation).

Goodman, Shimbo, Haas, Davidson, and Rieckmann (2008) further noted that depression symptom severity was positively associated with CAD severity only in those patients with new onset of depression in the initial post-MI period. CAD severity was not seen as a trigger for MDD in those patients with recurrent depression in the post-MI period. This may be related to first-time psychologic stress associated with a new CHD event in individuals who were not previously at risk for depression.

In a recent study, Davidson et al. (2010a) found that anhedonia associated with a diagnosis of MDD had a stronger relationship to all cause mortality and major adverse cardiac events in post-MI patients than did MDD alone which suggests that certain components of the depressed state as defined by the DSM-IV may have more cardiotoxic effects. Anhedonia is defined as “the loss of ability to experience pleasure in all or
almost all activities” (Davidson et al., 2010a; Fawcett, Clark, Scheftner, & Gibbons, 1983), and has been thought to be associated with catecholamine dysfunction (Hassler, Drevets, Manji, & Charney, 2004). Catecholaminergic dysfunction promotes a toxic state in cardiac myocytes (Singh, Communal, Sawyer, & Colucci, 2000) as well as platelet aggregation (Pondrid, Fuchs, & Candinas, 1990) and tachyarrhythmias (Lampert, Jain, Burg, Batsford, & McPherson, 2000). Impaired responsiveness to perceived rewarding stimuli is a behavioral hallmark of anhedonia (Hasler et al. 2004) which is often evident in CHD patient's avoidance of activities that are well known to improve cardiac outcomes (i.e. exercise, weight control, improved nutrition, smoking cessation, and medication compliance). This “impaired responsiveness” has been linked to the possibility that (in the anhedonic state) individuals may perceive physical symptoms related to impending MI as non-urgent and thus project a lack of urgency to their cardiology providers, which can potentially lead to higher cardiac morbidity and mortality (Davidson et al., 2010a).

Using the Myocardial Infarction and Depression Intervention Trial (MIND-IT) data (n=1989), van Melle et al. (2005) found that left ventricular ejection fraction (LVEF) was significantly related to the incidence and severity of depression in post-MI patients. As left ventricular (LV) dysfunction increased in the post-MI period, Beck Depression Inventory (BDI) depression scores increased by 0.99 points higher (95% CI 0.19-1.79; \( P = 0.02 \)) with an LVEF of 30-45% and three points higher with an LVEF of < 30% (95% CI 1.83 – 4.17; \( P < 0.01 \)). Patients with an LVEF of < 30% had 4.46 times the odds of having depression as compared to those individuals with preserved LV function (>60%)
even after adjusting for demographics, co-morbidities, baseline BDI screening scores, current depression at onset of MI, or presence of other cardiac risk factors.

**Congestive Heart Failure**

CHF affects approximately 5 million individuals yearly in the US (American Heart Association, 2008) and (along with bacterial pneumonia) is one of the top two diagnoses for hospital admissions. Patients admitted with a diagnosis of CHF produce a minimal annual expenditure of 8.4 billion dollars in hospital costs (Healthcare Cost and Utilization Project, 2006) and an estimated 60 billion dollars in overall CHF-related expenditures (Galbreath et al., 2004). CHF is defined as impaired cardiac pump function resulting in inadequate systemic perfusion. This condition is most commonly caused by left ventricular (LV) systolic dysfunction occurring as a result of some form of myocardial ischemia, prolonged untreated hypertension, or cardiomyopathy (Hobbs & Boyle, 2010).

Up to one-third of CHF patients exhibit some form of depression (Freedland et al., 1991; Koenig, 1998; Turvey, Schultz, Arndt, Herzog, & Wallace, 2002). In a meta-analysis of depression and heart failure, Rutledge et al., (2006) found that the prevalence of depression in CHF patients (21.5%) closely followed the prevalence of depression in global CHD. However, as New York Heart Association (NYHA) functional classification scores for CHF symptoms increased, the percentage of depression also increased. NYHA class III CHF patients had a 50% greater incidence of depression than class I or II patients, with similar increases noted between class III and IV, but class IV patients had four times the prevalence of depression as compared to class I patients.
Morbidity and mortality rates also increased proportionally to the severity and length of depressive symptoms.

The presence of depression may also be related to initial onset of CHF. Like CAD, CHF and depression are thought to be linked to biological mechanisms of inflammation (Redwine et al., 2009) and sympathetic activation (Guinjoan et al., 2007).

**Coronary Artery Bypass Graft**

CABG surgery is commonly used to treat occlusive CAD when percutaneous interventions are not able to be performed due to high levels of vascular blockage. The procedure consists of bypass grafting autologous donor vessels around occluded coronary arteries on the surface of the myocardium in order to improve myocardial blood supply and prevent ischemia (Morrow, Gersh, & Braunwald, 2005). Up to 50% percent of patients who receive CABG surgery develop post-operative depression and are at higher risk of having long-term poorer health-related quality of life (HRQoL) (Pignay-Demaria, Lesperance, Demaria, Frasure-Smith, & Perrault, 2003). CABG patients with MDD have a 2.4 fold increase risk of mortality as compared to their non-depressed counterparts (Blumenthal et al., 2003).

Depression is also an independent prognostic correlate for hospital readmission and cardiac-related morbidity after CABG (Burg, Benedetto, Rosenberg, & Soufer, 2003; Connerney, Shapiro, McLaughlin, Bagiella, & Sloan, 2001; Saur et al., 2001; Tully, Baker, Turnbull, & Winefield, 2008). Wellenuis, Mukamal, Kulshreshtha, Asonganyi, and Mittleman (2008) studied atherosclerotic progression of grafts in depressed post-CABG patients and found a 50% greater risk of worsening progression of graft plaque
formation in this population which significantly increased risk for re-occlusion and further morbidity.

Quality of life (QOL) and return to normal daily activities for post-op CABG patients was studied by Mallik et al. (2005). The investigators found that depression was inversely related to functional improvement over a 6-month period post-CABG, and that this association was stronger than the association with traditional heart-related illnesses (CHF, MI, and ACS) previously discussed. Along with depression, CABG surgery patients often report persistent somatic symptoms including fatigue, shortness of breath, angina, and insomnia that can also adversely affect QOL and participation in rehabilitation and further worsen depressive symptoms (Barnason, et al., 2008; Goyal, Idler, Krause, & Contrada, 2005). Cardiology clinicians need to be especially aware of risks for depression, need for screening, and possible interventional requirements in this population (Rollman et al., 2009) as post-op CABG patients may have not been in outpatient cardiology care prior to surgery.

**Implantable Cardioverter Defibrillators for Cardiomyopathy**

ICDs are implantable defibrillators used in patients who are at risk for ventricular arrhythmias which predispose susceptible individuals to sudden death. ICD placement is sometimes required after a major adverse cardiac event in which myocardial tissue is severely damaged from ischemia (Crespo, Kim, & Selzman, 2005). Patients who have ICDs for ischemic heart disease are presumably at higher risk for depression because of their underlying CHD, and may also be more susceptible to ventricular arrhythmias leading to increased ICD shocks. Using data from the large multi-center Triggers of
Ventricular Arrhythmias (TOVA) trial, Whang et al. (2005) tested this hypothesis and found a statistically significant association between moderate to severe depression and number of appropriate ICD shocks after adjustment for multiple confounders. The trend towards first-time shock was significant \( (P = 0.02) \) in the overall sample \((n=645)\) and remained significant \( (P < 0.01) \) in the CAD subgroup \((n=476)\). These findings supported the findings of Carney et al. (1993) who also noted an increased risk of ventricular tachycardia in depressed CAD patients completing 24-hour Holter monitoring studies. Whang et al. (2005) suggested that more aggressive surveillance, testing, and treatment for depression in this high-risk population should be undertaken to improve QOL and enhance patient outcomes.

**Pharmacological Treatment of Depression for CHD Patients**

Safety and efficacy of pharmacological treatment for depression in CHD patients has been the focus of multiple studies. Tricyclic antidepressants are well known to cause potentially dangerous cardiac side effects and are not routinely recommended for use in CHD patients (Roose & Glassman, 1989; Roose, 2003). Roose et al. (1991) found that bupropion (Wellbutrin) treatment in a sample of CHD patients with depression significantly increased supine systolic and diastolic blood pressure \((5\text{mm Hg}\ [P <.01]\) and \(3\text{mm Hg}\ [P <.005]\) respectively) and increased orthostatic blood pressure drop \((3\text{mm Hg};\ P <.02)\). The findings of the Roose et al. (1991) study also showed an 82\% suppression of ventricular depolarization \((P < .05)\) which could potentially put patients at risk for CHD-related complications.
Current pharmacological treatment of depression with CHD focuses on the use of selective serotonin reuptake inhibitors (SSRIs). A variety of clinical trials have sought to determine the cardiogenic influences of SSRI treatment of depression in non-CHD and CHD patients. Results of the SADHART trial showed that sertraline (Zoloft) was safe and effective for use in CHD patients with depression and improved overall QOL and daily functioning. Numerically lower (but not statistically significant) incidence of major CHD-related events was noted with sertraline therapy by Glassman et al. in 2002, however, Barr-Taylor et al. (2005) found that subjects in the Enhancing Recovery in Coronary Heart Disease Patients (ENRICHD) trial had a decreased risk (43%) of death or recurrent MI with the use of SSRI therapy (but not with other antidepressants i.e. bupropion). In an earlier study, McFarlane (2001) also found that treatment with sertraline in a small sample of depressed post-MI patients assisted with normalization of HRV to that of similar non-depressed patients.

Platelet activation was noted to return to levels seen in control subjects after six weeks of paroxetine (Paxil) therapy in a study completed by Musselman et al. (2000). These findings were supported by Pollack et al. (2000) in a study using paroxetine therapy; and Serebruany et al. (2003) using sertraline therapy for a group of depressed CHD patients on concomitant aspirin and clopidogrel therapy. Post-ACS patients on sertraline in the study reportedly received an added benefit of decreased platelet and endothelial activation while on standard anti platelet therapy. Chrapko et al. (2006) found that the administration of paroxetine to a sample of depressed patients and healthy controls increased plasma NO significantly after the first two ($P = 0.04$), six ($P = .005$),
and eight \((P < .01)\) weeks of therapy which could improve endothelial function and decrease overall risk for the development or progression of CHD.

Khaykin et al. (1998) discovered that treatment with doxepin (Sinequan) or fluoxetine (Prozac) produced symptom remission in most patients in a non-CHD sample and concurrently increased HRV. However, non-responders to pharmacological therapy in the study showed decreased HRV. These findings brought forth the theory that adequate response to depression treatment may be a primary factor in successful physiologic outcomes related to CHD.

No deleterious cardiovascular (CV) adverse events have been reported with the use of sertraline, paroxetine, or fluoxetine in the literature (Chrapko et al., 2006; Glassman et al., 2002). Paroxetine has been associated with weight gain in some individuals (women > men) at daily doses higher than 20 mg (Fava, Judge, Hoog, Nilsson, & Koke, 2000) and mild elevations in low density lipoprotein-C (Lara, Baker, Archer, & Le Melledo, 2003) which can add to overall CV risk factors for CHD. Fluoxetine and sertraline are associated with minimal weight gain and may be more desirable for use in those patients with elevated body mass indices (Fava et al., 2000). Because SSRIs can influence some drug metabolism in the cytochrome P450 hepatic pathway, it is important to consider possible drug-drug interactions with multiple medication use often present with CHD (Roose, 2003).

Sertraline, escitalopram (Lexapro), venlafaxine, bupropion, and mirtazapine were selected as treatment choices in the Coronary Psychosocial Evaluation Studies (COPES) trial (Davidson et al., 2010b). No reported adverse drug events were noted in the study.
findings which suggest good drug tolerance. Patients were followed in clinic 1-2 weeks after initiation of therapy for medication adjustment and every 3-5 weeks afterwards as needed for the first 6 months of therapy.

Even though there is evidence to support the potential for improvement of some physiologic CHD risk factors with SSRI therapy, the findings in the literature have yet to show a clear direct relationship between successful pharmacological treatment of depression and decreased overall morbidity and mortality in CHD patients. This relationship will likely be the primary focus of future studies examining pharmacological treatment of depression in the presence of CHD (Joynt & O'Connor, 2005).

There is significant concern in the literature regarding the idea that treatment-refractory depression in patients with advanced CHD could be closely related to pathophysiologic influences of depression and CHD that were described earlier in the literature review. Those individuals who do not adequately respond to depression treatment require closer follow up, comprehensive pharmacologic and psychosocial therapy, and aggressive intervention for all modifiable risk factors associated with CHD in order to maximize health outcomes (Carney et al., 2002).

**Beta Blocker Therapy and its Relationship to Depression**

The use of beta-blocker therapy commonly used in CHD treatment protocols has been widely thought to be associated with increased risk for depression (van Melle et al., 2006). The MIND-IT (Van den Brink et al., 2002) and Depression and Myocardial Infarction (DepreMI) (Spijkerman et al., 2005) trial data were used by van Melle et al. (2006) to address this important clinical issue. Results of the van Melle et al. (2006)
investigation showed that there was no significant difference in depression scores between beta-blocker users and non-users in a large sample of matched post-MI patients (n=381; 127 non-users and 254 users) evaluated at 3, 6, and 12 months post-MI. However, there was a significant relationship between increasing depression screening scores and high dose beta blockade at six months (7.2 vs. 5.6, $P = 0.03$) and 12 months (7.4 vs. 5.8, $P = 0.05$) which suggests that the use of a lowest dose of beta-blocker therapy to improve cardiac function should be prescribed in order to minimize or prevent worsening depressive symptoms in at-risk CHD patients. Von Kanel & Begre (2006) further suggested that those individuals who are prescribed high-dose beta blockers be closely monitored for delayed new onset of depressive symptoms in the 6-12 months after initiating therapy.

**The Role of Omega-3 Supplements for CHD Patients with Depression**

In 2001, a national survey showed that 54% of individuals with depression were using alternative supplements to treat their depressive symptoms (Kessler et al., 2001). Since then, multiple studies have suggested that deficiencies in omega-3 polyunsaturated fatty acids (PUFAs) may contribute to depressive symptoms. Proportionally lower levels of omega-3 to higher levels of omega-6 were noted in subjects with depression as compared to controls in a non-CHD sample (Appleton, Rogers, & Ness, 2008), and in a sample of patients with CHD (Frasure-Smith, Lesperance, & Julien, 2004). Omega-3 PUFAs are thought to assist with monoamine functions (Chalon, 2006) and modulation of the inflammatory response (Maes et al., 2009) in the central nervous system. They have long been associated with cardio protection and decreasing risk for sudden death.
through their potent anti-inflammatory effect (Demaison & Moreau, 2002) and promotion of electrical stabilization of the myocardium (Marchioli et al., 2002).

Using the findings of prior studies, Lesperance et al. (2010) completed an inclusive double-blind randomized controlled trial (RTC) (n=432) to determine if omega-3 supplementation (1,050 mg/d of EPA and 150mg/d of DHA) would reduce depressive symptoms in patients with MDD. Study results showed non-significant trends toward improved depression over time in the total sample; however in sub-group analysis, there was a significant improvement in those patients without a co-morbid anxiety disorder ($P = .035$). This finding gives some validation to the use of omega-3 supplements in those patients with CHD and depression who have no associated anxiety disorders.

**Psychosocial Treatment of Depression for CHD Patients**

Along with medication therapy, five interventions have been identified to be effective in treating depression in CHD patients. These include psychosocial support, education, behavioral change, cognitive behavioral therapy, and relaxation training. Psychosocial support consists of practices that encourage sharing of experiences between patients, or patients and their families in order to support confidence-building practical adaptation to changing health status (Welton, Caldwell, Adamopoulos, & Vedhara, 2009). Educational interventions provide knowledge to patients about their specific illnesses (i.e. cardiac anatomy and disease processes, general cardiac risk factors, and impacts to daily living etc.). Therapeutic support for behavioral change includes encouraging practices that will directly impact cardiac health such as smoking cessation, weight loss, and exercise (Glanz, Rimer, & Viswanath, 2008). CBT is provided by
specialized counselors in order to help CHD patients adapt to changing health; and relaxation therapy such as meditation, yoga, and tai chi is designed to assist CHD patients in decreasing overall autonomic tone which can worsen CHD (Welton, Caldwell, Adamopoulos, & Vedhara, 2009; Whang et al., 2005).

Findings from the ENRICHD trial showed that patients who were treated with CBT and an SSRI for 6 months after an MI had decreased depression as compared to the usual care group. However, the interventions did not show a relationship to increased survival during the study period (Writing Committee for the ENRICHD Investigators, 2003). Carney et al. (2004) studied the same population over an extended period of time (29 months post-MI) and found a significant relationship between successful depression treatment (as evidenced by decreasing BDI scores) and increased survival rates. In this population, a stronger relationship to decreased incidence of mortality was noted in those individuals who received both SSRI therapy and CBT as compared to CBT alone. Previously, Carney et al. (2000) had also found that the use of CBT as a single treatment not related to drug therapy, improved HRV in a sample of CHD patients with MDD. These findings give some support to the therapeutic benefits of CBT for CHD patients.

Saab et al. (2009) further analyzed the data from the ENRICHD trial with regard to the addition of a group therapy component of care and found that group plus individual therapy may be associated with overall decrease in mortality in CHD populations; however, the authors recommended further study using an RCT study design to clarify the findings.
In the COPES trial, Davidson et al. (2010b) used a five-component strategy based on the IMPACT model (Unutzer et al., 2002) to treat depressed CHD patients. These components consisted of (1) patient preferences for psychologic and/or pharmacological treatment, (2) patient participation in problem solving therapy (3) using an enhanced care approach by a psychiatric specialist, (4) stepped care which evaluated symptom improvement every 8 weeks based on predetermined treatment decision rules, and (5) use of a standardized instrument to track depression.

Problem solving therapy was focused on augmenting individual patient strengths by teaching patients to systematically evaluate and correct individual psychological problems. Patients were encouraged to participate regularly in individually selected pleasant activities. Rozanski and Kubzansky (2005) had previously suggested that maintaining this pattern of vitality promoted a “positive and restorative state that is associated with a sense of enthusiasm and energy”.

In the COPES trial weekly visits to psychiatric specialists were increased or decreased as patient needs presented. Close contact was encouraged through direct visits or telephone contact (Davidson et al., 2010b). By encouraging full patient participation in selecting and planning care, care remained individualized, increased engagement occurred, and satisfaction with care was heightened. This pattern of care promoted emotional and coping flexibility in order to assist patients in learning how to regulate emotions and cope with challenging new experiences (Rozanski & Kubzansky, 2005; Whooley & Unutzer, 2010).
Pharmacological treatment was provided to patients according to need. Periodic screening for depression using the PHQ-9 was undertaken in order to monitor patient progress and make adjustments in care based on patient choices and provider recommendations (Whooley & Unutzer, 2010).

Outcomes of the COPES trial showed that by the end of the 6-month trial, 48% of the treatment group were taking antidepressants as compared to 30% of the usual care subjects. Thirty-nine percent of intervention patients had participated in psychotherapy as compared to 12% of usual care patients. At the 9-month follow-up, 54% of patients in the intervention group reported excellent or very good satisfaction with depression care. In contrast, only 19% of usual care subjects were highly satisfied with their care.

Overall, depression symptoms decreased significantly in both groups in the COPES trial, but group differences emerged around four months into the trial with the intervention group showing a greater effect. Patient-reported adverse events did not differ between the two groups with the exception of major adverse cardiac events (4% intervention vs. 13% usual care). Levels of major cardiac adverse events in the intervention group remained at the level of non-depressed CHD patients which was a positive secondary finding in the study and suggests that effective multidimensional approaches to depression treatment may decrease overall risk of further cardiac morbidity and mortality.

In another psychosocial study of depression and CHD, Allan, Johnston, Johnston, and Mant (2007) found that depression in the immediate post-MI period was a key factor in patients’ perceived behavioral control, and directly influenced future exercise
behaviors that were important for decreasing CHD risks. Participation in future fitness and activity in the months following an ACS event may be predicted by diagnosis of depression during hospitalization. This is thought to be related to the high predictive value of current depression to risk of future depressive events. Effective pharmacological therapy and initiation of CBT for patients in the early stages of depression post-MI may improve exercise participation (which has also been found to be highly effective in depression treatment) (Brosse, Sheets, Lett, & Blumenthal, 2002; Camacho, Roberts, Lazarus, Kaplan, & Cohen, 1991).

The evaluation of QOL is challenging for cardiology clinicians due to lack of appropriate tools to assess minimally important differences in clinical change that impact QOL (Wyrwich, Nienaber, Tierney, & Wolinsky, 1999). Mendes de Leon et al. (2006) attempted to study the effects of a psychosocial intervention on QOL in a sample from the ENRICHD trial (The ENRICHD Investigators, 2003), and found that even though fatigue, dyspnea, and emotional dysfunction were key indicators of perceived QOL for CHD patients (Jaeschke, Singer, & Guyatt, 1989), interventions to modify negative feelings and thoughts may be more important. This construct correlates with the concept of adaptive change in the Continuity of Aging theory where individuals move towards adaptive strategies when exposed to disease by changing how they perceive their illness (Atchley, 1999).
Challenges in the Treatment of Depression with CHD

Multiple barriers exist in the treatment of depression associated with CHD. Because of the inherent range of symptoms from mild episodic depression to dysthymia and MDD expressed by CHD patients at any given time in the CHD continuum, it is challenging for providers to detect true and consistently meaningfully treatable depression disorders (Jiang, et al., 2001). Koenig, George, Peterson, & Pieper (1997) found that accuracy of predicting depression in medically ill older adults varied from 10% to 21% depending on which screening tool was used to detect symptoms. This finding supports the need for proper selection of an appropriate screening tool for use in medically ill CHD patients, which may be different from tools used to detect depression in the general population.

Studies are lacking with regard to the true effectiveness of CBT, whether in individual or group settings; and the appropriate number of CBT sessions or encounters needed to consistently and effectively improve patient outcomes (Joynt & O'Connor, 2005). Finally, improving outcomes in cardiac morbidity and mortality verses improving overall quality of life (QOL) with effective depression treatment alone are sometimes separate and distinct. Cardiology providers will need to consider all outcomes as equally important goals when providing effective depression care for CHD patients.

Health Care Burden of Depression with CHD

In a report of economic impacts associated with CHD and depression, Kurdyak, Gnam, Goering, Chong, & Alter (2008) noted that depression independently predicted non-cardiac related hospitalizations for post-MI patients (43% higher), all cause patient
re-hospitalizations (24%), and overall cardiac related hospitalizations and emergency room visits (9%). Depressed CHD patients with less severe CV illness reportedly sought more frequent outpatient cardiology and general medicine care. Conversely, CHD patients with no depression tended to use health services more closely matched to severity of illness.

Successful treatment of depression often results in overall lower health care costs for individuals and society. In general, health services-related costs in the first six months of treatment for an episode of MDD range from $1832.00 to $2210.00 for individuals who achieve remission of symptoms. For individuals who improve, but do not achieve remission, costs of treatment range from $2350.00 to $2812.00. Finally, individuals who report treatment-resistant depression spend between $2802.00 and $3416.00 in the same time period (Simon, 2006). Katon et al., 2006) noted that in an older adult population, ambulatory and inpatient health care costs were 50% higher for depressed verses non-depressed patients. Gameroff & Olson (2006) also reported that patients with MDD had significantly increased mean health care expenditures as compared to non-depressed patients over a 9-month period ($19,838.00 verses $6,268.00). These findings support the need for comprehensive efficient and effective management in the diagnosis and treatment of depression for CHD patients in order to decrease the overall burden of health care expenditures in the US.

Current Methods for Treating Depression in Outpatient Cardiology Practice

The most recent comprehensive survey of cardiologists (who belonged to the American College of Cardiology) was undertaken by Feinstein et al., (2006) to
understand cardiologists’ perceptions about depression treatment in outpatient cardiology practice. Overall, cardiologists in the sample (n=796) agreed that depression contributed to the prognosis of CHD (88.8%), strongly impacted patient success in undertaking healthy lifestyle modifications (97.2%), and contributed to the patient's poor adherence to medical guidance (92.3%). Approximately 85% believed that up to half of their patients had depression, but less than 75% (71.2%) actually talked to a small percentage of their patients about depression. Fifty-five percent felt comfortable diagnosing depression, and 21% used a standardized screening tool. Less than 50% of cardiologists believed that an independent relationship existed between depression and CHD, another 32% did not agree, and 17.5% reported no knowledge about the relationship.

The majority of cardiologists in the sample referred depressed patients to psychiatrists for treatment (83%) followed by psychologists (43.2%), and social workers (32.3%) or other mental health providers (19.5%). Approximately 56% treated their depressed patients with medication. The majority of patients were treated with SSRIs, however, 3.8% had prescribed high-risk tricyclic antidepressants. Patients were also treated with non-pharmacological interventions; exercise (81.1%), relaxation training (60.2%), stress management (53.8%), psychotherapy (45%), and daily journaling (9.9%).

Another study focusing on depression diagnosis and treatment reported a lack of effective screening and treatment in current outpatient specialty practice and validated the importance of case-finding and effective interventions on patient outcomes. Keefer, Sayuk, Bratten, Rahimi, & Jones (2008) undertook a study to analyze gastroenterologists' ability to diagnose depression in outpatient care. Specialty providers in this study missed
diagnosing depression 80% of the time. This finding suggests the possibility that other specialists also neglect to inquire about depressive symptoms and/or use appropriate screening tools to accurately detect depression in outpatient practice.

Similar findings have also been shown in primary care practice. Multiple studies have reported that detection and treatment of depression in primary care settings continues to be less than adequate (Bogner, Dahlberg, de Vries, Cahill, & Barg, 2008; Bogner & de Vries, 2008; McQuaid, Stein, Laffaye, & McCahill, 1999; Simon, 1998; Unutzer, et al., 2001). Because current depression care practices in cardiology clinic settings often include first-line referral back to primary care providers (PCPs) for depression treatment (cardiologist, personal communication, July 14, 2010), depressed patients with CHD may be at further risk of inadequate treatment if PCPs fail to provide comprehensive follow-up care. Lack of ownership for treatment responsibility between cardiologists and PCPs, and lack of effective diagnostic and treatment plans for depression care (offered by all providers) can lead to sub-optimal health outcomes for this high risk population.

Whang and Davidson (2009) admitted that treating depression in the presence of CHD is challenging due to lack of full understanding about the depressive phenotype that is associated with CHD (Goodman et al., 2008), and the ways in which depression is manifested in vulnerable populations with specific cardiac disease states (Carney et al., 2002). CHD is a major infirmity in the vulnerable older adult population. A positive diagnosis of CHD often coexists with underlying depression, and the evidence is strong for an overall increased risk for depression and dysthymia in older adults with cardiac

The evidence in this literature review supports the need for incorporation of effective depression diagnostic and care strategies into outpatient cardiology practice for at-risk CHD patients as part of a best-practice model to improve overall patient outcomes. Finally, Whooley & Unutzer (2010) suggests that true collaborative and integrative depression care encompassing cardiology, primary care, and behavioral health may increase overall provider participation and improve effective treatment for vulnerable CHD patients.

**Limitations in Current Research**

Research on depression in the presence of CHD over the past forty years has been expansive and comprehensive with regard to potential physiologic causal mechanisms and various treatment modalities. However, there is a lack of understanding about the real-world practices of cardiology providers with regard to outpatient depression care. The majority of studies were reported in behavioral health journals (see references) which may limit exposure with regard to knowledge sharing and education for cardiology providers. There was also a lack of qualitative studies that examined the lived experience of depression as it related to interpersonal dynamics in families. This area of study is particularly important for understanding how the onset of depression in the early days and weeks after an ACS event or emergent CABG procedure affects patients and families and can potentially help to maximize early depression intervention and care. No studies
discussed the concept of patient education prior to elective CABG as an intervention to decrease post-operative depression. Finally, there were minimal studies focusing on understanding the potential pathophysiologic role that intraoperative cardiac bypass pump exposure may have on developing post-operative depression.

**Summary**

Individuals with all CHD-related morbidity are at higher risk for developing varying levels of dysthymia and MDD. Cardiology providers have an opportunity to be at the forefront of improving interventional patient outcomes in the treatment of depression, but may lack understanding and commitment to achieve these goals. Comprehensive therapeutic approaches to screening and treatment of depression in outpatient cardiology practice are necessary to maximize patient outcomes in CHD-related depression care.
CHAPTER III
RESEARCH METHODS

Study Design

Using a quasi-experimental descriptive pretest-posttest study design, this practice inquiry sought to understand diagnostic and treatment practices for depression in the presence of CHD by cardiology providers in a large metropolitan private outpatient cardiology practice. In this study, providers were asked to complete an initial survey of knowledge about depression and its relationship to CHD; and individual practices used in the treatment of depression in outpatient cardiology settings.

After the completion of the initial survey, a valid, reliable, and easy-to-use depression screening tool was made available for a designated period of time in the electronic medical record (EMR) currently in use by the practice under study. The goal of this intervention was to expose providers to the use of a depression screening tool and facilitate depression screening by providers in the sample practice, in order to identify patients at risk for depression and promote accurate timely interventional treatment and referral as indicated. The sample population was then re-surveyed to assess for any change in depression care practices. Using parametric testing, data from Survey 1 and Survey 2 were to be analyzed to compare differences in the sample before and after the exposure to the screening tool in the EMR, in order to formulate an effective plan for depression care for patients in the sample practice.
Setting

The setting for this study was a multi-office private cardiology practice. Cardiology care was provided at four main clinic sites in a large metropolitan area, and five satellite clinics in surrounding towns. Approximately 50,000 patients received care in the combined clinic sites. The clinic populations were largely made up of Caucasian, Hispanic, and Native Americans, as well as small numbers of African American and Asian sub-groups. The large majority of patients were over 65.

Sample

The sample was made up of physician cardiologists/cardiothoracic surgeon practice partners (29) and nurse practitioners (9). Nurse practitioners were employed by the practice, but practiced in collaboration with individual physicians. Not all physicians worked in MD/NP teams. One physician was a cardiothoracic surgeon. All physician providers had at least one assigned medical assistant (MA). All physicians and nurse practitioners practiced within a “practice in a practice” model where practice resources were shared, but unique styles of care remained individualized. All nurse practitioners were female with the exception of one male, and all physician providers were male. All cardiology providers (i.e. NPs and MDs) employed by the practice were included in the survey in order to obtain comprehensive and role-specific data for current depression knowledge, screening, and treatment practices.
**Procedures for Protection of Human Subjects**

Approval for this study was obtained from the Human Subjects Protection Program Internal Review Board at The University of Arizona. Human subjects information was protected by using a numerical code on each completed survey and a password protected data file.

**Data Collection**

Data was collected using structured self-report surveys adapted with permission (R. Feinstein MD, personal communication, November 11, 2010) from a survey instrument used by Feinstein et al. (2006) to evaluate depression treatment practices by a large sample of cardiologists in the United States (see Appendix A and Appendix B). Only questions from the original survey in which Feinstein and his colleagues reported data (Feinstein et al., 2006) were considered for inclusion in the surveys for this study. The repeated use of a majority of the questions used in the 2006 survey improved transferability and understanding of current outpatient cardiology practice as compared to practice in 2006. A review of the survey instrument was completed by one chronic care nurse practitioner, a mental health nurse practitioner, a psychiatrist, a geriatric registered nurse, and a psychiatric registered nurse, to ensure clarity of the questions and further enhance validity for this study (C. Carithers RN, MS, FNP-C, personal communication; T. Badger PhD, MHNP-C, personal communication; D. Gunter MD, personal communication; L. David RN, personal communication; C. Keith RN, personal communication).
Prior to the initial survey (see Appendix A), all providers were notified about the study and impending survey through inter-office electronic mail. Survey data collection was completed over a 10-business day period. Surveys were initially hand-delivered to all cardiology providers by the principal investigator. The purpose and potential benefits of the study were also briefly discussed with each provider when initial surveys were delivered.

A single page disclosure of information sheet was attached to the front of each survey and consent was implied with completion of each survey. Verbal and written instructions for completion and return of surveys to collection boxes were given to providers. Providers could also return completed surveys to respective office managers for placement in survey collection boxes (located at each of the four main clinic sites). Instructions to seal surveys in plain unmarked envelopes accompanying the surveys were reviewed with all providers as well. Office managers were also informed of survey collection processes in order to assist providers in the completion and collection of surveys.

As a follow-up to assist busy cardiology providers with participation in the study, respective office managers at each clinic site attempted to keep track of providers who turned in surveys. Those providers who did not turn in surveys were reminded to complete surveys (if they chose to) by office managers, and offered a second copy of the survey if needed. At the end of the tenth business day, no further surveys were accepted for inclusion in the data analysis.
The second data collection using the follow-up survey (see Appendix B) was initiated two weeks after provider exposure to the depression screening tool in the EMR using the exact survey completion protocol for the first survey.

**Data Analysis**

The data were analyzed using SPSS statistical software package version 14.0 (SPSS, 2005). Descriptive statistics were used to summarize the demographic characteristics of participants, knowledge of depression, and treatment practices of this sample of practitioners before and after exposure to an intervention.

**Aim 1**

Aim 1 was to describe current outpatient treatment of depression for CHD patients provided by a defined cardiology practice after administration of the *Survey 1 of Depression Treatment in Outpatient Cardiology Practice* tool to a convenience sample of nurse practitioners and physicians. After informing providers of the upcoming study via electronic mail, Survey 1 was distributed to the sample as described in the study methods. Some providers were difficult to locate in the initial days of the first survey distribution process due to shortened or rescheduled clinics, hospital call schedules, hospital emergencies, and scheduled leave. Because of this, the first phase of Survey 1 distribution was not completed until Business Day 5. All providers were asked if they had received the study notification email with distribution of Survey 1. Some reported that they had not checked their email lately and were verbally informed about the study by the principle investigator.
The second phase of the distribution process began on Business Day 6. Office managers were re-enlisted to help track the survey completion process although this remained challenging due to varying provider schedules and multi-office practice sites. All office managers at the four main clinic sites recommended that the second phase of survey distribution be monitored by the provider’s assigned MAs. MAs for the individual providers all agreed to offer a second copy of the survey to their providers if a survey had been misplaced prior to completion.

Survey collection boxes were placed in central locations at each of the four main clinic sites and one satellite clinic. Each provider was made aware of the location of the boxes at their respective clinics during the first phase of the survey distribution. Providers were also informed that surveys could be returned to any of the designated collection boxes at the five main clinic sites. Individual MAs were also instructed as to the location of the collection boxes in order to facilitate survey collection. On Business Day 6, the second phase of Survey 1 distribution was initiated. The survey collection boxes were checked for correct location placement. One box that had been placed under a desk out of visual range was returned to the designated location. Two completed surveys had been returned to each of the collection boxes. At the end of the 10-business day trial, survey collection boxes were retrieved from the clinic sites for survey data analysis.

**Aim 2**

Aim 2 was to adapt the Patient Health Questionnaire-9 (PHQ-9) depression screening to the EMR to be made available to cardiology providers in the sample
population over a designated period of time. Aim 2 was accomplished by assisting the cardiology practice technical support team in formatting a template for depression screening into the existing EMR used by the sample practice. After the completion of Survey 1, all providers in the sample received education about the screening tool via electronic mail and had access to the tool in the EMR over a two-week period. The goal of this intervention was to make available a valid, reliable, and easy-to-use depression screening tool for provider use in the sample practice in order to identify individuals at risk, and facilitate accurate and timely interventional depression treatment and referral as indicated.

Adaptation of the PHQ-9 screening template to the EMR was accomplished by incorporation of the tool into the existing Review of Systems (ROS) template. Symptoms consistent with a possible depressive disorder (depression, anxiety, nervousness, and altered mental status) reported by patients on initial clinic check-in sheets were entered into the EMR under “ROS” by a medical assistant. When providers accessed the ROS during patient visits, a pop-up reminder to “SCREEN FOR DEPRESSION” was generated on the ROS screen shot for those patients who reported at-risk symptoms (see Appendix E). Easy access to the “PHQ-9 Depression Screen” and “PCP Depression Notification” templates were also located on the ROS screen shot. Scoring for the screening tool was automatically calculated as questions were answered to assist providers with quick interpretation at the end of each test. Access to the interpretation tool for the PHQ-9 (see Appendix G) was located on the “PHQ-9 Depression Screen” template (see Appendix F), and was easily attainable for interpretation.
Aim 3

Aim 3 was to evaluate the effectiveness of exposure to a depression screening tool in the sample population by administering the Survey 2 of Depression Treatment in Outpatient Cardiology Practice (see Appendix B) tool after a designated period of time. Evaluation of the effectiveness of use of the screening tool by the providers in the sample was accomplished by re-surveying the sample population using Survey 2 after a two-week period of exposure to the depression screening tool made available in the EMR. Repeat surveying of the sample population was achieved using the same protocol to accomplish Aim 1.

Selection of the Screening Tool

The original BDI (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and newer Beck Depression Inventory II (BDI-II) (Beck & Steer, 1984) were noted to be the most widely used depressions screening instruments to detect depression in multiple populations in the literature. However, the BDI-II is not suggested for use in older adults (Sharp & Lipsky, 2002).

The 30-item and 15-item Geriatric Depression Scales have been reported to be highly reliable for detecting depression in older adults ($r = .84$, $P < .001$) (Sheikh & Yesavage, 1986). However, the use of these depression scales in real-world cardiology practice settings is limited due to increased length of administration time in busy practice settings, and the high probability that patients under 65 will also need to be screened for depression.
The Cardiac Depression Scale has been used to measure levels of symptoms of depression in CHD patients (Hare & Davis, 1996; Wise, Harris, & Carter, 2006), but is not to be used as a comprehensive diagnostic tool (Page et al., 2010; Wise, Harris, & Carter, 2006). This instrument may be beneficial to detect subclinical depressive symptoms in patients who pass more conventional depression screenings.

The PHQ-9 (see Appendix C) (Spitzer, Kroenke, & Williams, 1999) was selected as the instrument for use in depression screening in this sample cardiology practice. Application of this tool in an EMR format was considered to be innovative for depression screening in outpatient clinic settings. A complete description of the PHQ-9 tool and instructions for use can be accessed at [http://www.depression-primarycare.org/images/pdf/phq_9_eng.pdf](http://www.depression-primarycare.org/images/pdf/phq_9_eng.pdf) (Patient Health Questionnaire, 2009).

The PHQ-9 instrument displays a high degree of specificity for depression (90%) and a high positive predictive value for clinical depression with scores of 10 or above (Kroenke, Spitzer, & Williams, 2001; Spitzer et al., 1999). Clear treatment guidelines (see Appendix D) are correlated with numerical scores which improves interventional management of patients with depression. An important benefit of this screening tool is the provision of an associated question about chronicity of symptoms that targets those individuals who may present with dysthymia.

The PHQ-9 is a self-report questionnaire that can be easily formatted to fit in an EMR template (see Appendix F) and can be administered by a MA or provider in less than two minutes ((Spitzer et al., 1999; Whooley, 2006). It was originally designed to be completed by patients; however verbal administration of the tool to older adults in a
question and answer format may improve accuracy of results and can alert providers to specific symptoms that may require urgent follow-up (suicidal ideation).

Total possible score for the PHQ-9 is 27. Scores between five and nine correspond with minimal symptoms. Mild depression, dysthymia, or mild major depression may be evident with scores of 10 to 14. Moderately severe major depression is seen with scores of 15 – 20. Scores above 20 indicate severe MDD (Patient Health Questionnaire, 2009).

Limitations of the Study Design

This study design is primarily limited by its lack of generalizability to other outpatient cardiology practice settings. The sample sized is notably small compared to a previous survey of a similar population sampled by Feinstein et al. (2006); however the sample size for this study is relatively large for a private practice setting. The study design is also limited by the small sample of advanced practice nurses completing the survey in order to understand variability between different types of providers with regard to depression screening and treatment. No general inferences can be made from the data with regard to overall screening and treatment practices in the cardiology profession as a whole; however the goal of the inquiry is to improve patient outcomes in a focused practice setting. Validity of the data may have been influenced by notification of providers about the impending study prior to the first survey; however it was believed that overall participation would have been enhanced with prior notification regarding the purposes of the study.
Summary

This descriptive practice inquiry sought to understand the current practices of a select group of cardiology providers with regard to diagnosis and treatment of depression in the presence of CHD. Two survey tools were used to collect data for analysis before and after an intervention. Findings of the data were used to improve outcomes in the screening and treatment of depression for CHD patients by cardiology providers in a select outpatient cardiology practice setting.
CHAPTER IV
RESULTS OF THE INQUIRY

Aim 1

“Describe current outpatient care of depression in the presence of CHD, provided by a defined cardiology practice through the administration of the Survey 1 of Depression Treatment in Outpatient Cardiology Practice tool to a convenience sample of nurse practitioners and physicians.”

Results from Survey 1

By the time data collection had begun, one physician had left the practice. Two physicians verbally declined to participate in the study. Fifty-five percent of the nine eligible NPs (n=5) and 54% of the remaining 26 MDs (n=14) responded to the survey. NPs who participated in the study averaged 9.8 years in practice (2 years to 17 years). Of the 14 MDs who participated in the study, 29.4% (n=5) did not respond to “years in practice”. Those physicians who did respond had practiced an average of 18.5 years (6 years to 50 years). The average years of experience for all providers who responded in the practice sample was 15.43 years (SD = 12.005).

Relationship of Depression to CHD

Among the cardiology providers, 73.7% (n=14) believed that depression does exert its effects indirectly through other conventional cardiac risk factors, and that depression does contribute to the progression of CHD; however, only 31.6% (n=6) believed that depression was an independent risk factor for CHD (12 = no, 1 = unsure). All survey respondents felt that depression contributes to the inability to make good
lifestyle choices which might decrease risk factors for CHD. The majority of respondents (89.5%) also believed that depression contributes to medication therapy non-adherence.

**Screening for Depression**

Most respondents (84.2%) had asked their patients about depressive symptoms at some time in their practice. However, the majority (78.9%) of those providers asked about depression less than 25% of the time (15.8% = none of the time; 31.6% = 1-10% of the time; 31.6% = 10-25% of the time). Three providers (15.8%) asked about depression 25-50% of the time, and one provider asked about depression 50-75% of the time.

Only half of providers (52.6%, n=10) felt comfortable making a diagnosis of depression; however, no providers used a formal screening tool. Clinical judgment was the most frequently used method for determining the presence of depression (78.9%), followed by patient report (63.2%), and family report (57.9%). All NPs used a combination of clinical judgment, patient report, and family report, as did seven (53.8%) of the MDs. One MD used both clinical judgment and patient report to diagnose depression, three MDs did not consider patient or family report, and the remaining three MDs did not diagnose depression at all.

**Treatment of Depression**

Eleven of the 19 respondents (NPs = 1, MDs = 10) did not prescribe medications for depression. For the remaining eight providers (42.1%) (NPs = 4; MDs = 4) who did prescribe antidepressant medications, SSRIs were selected as first-line therapy.

Some respondents listed specific drugs as first-line therapy. Escitalopram (Lexapro) was reported most often (n = 3) followed by paroxetine (Paxil) (n= 2) and
fluoxetine (Prozac) (n = 1). SNRIs were also prescribed by two MDs and two NPs. Duloxetine (Cymbalta) was the only SNRI listed for consideration as first-line therapy (n=1). One atypical antidepressant (bupropion [Wellbutrin]) was prescribed by three NPs and one MD; however this medication was not listed as first-line therapy by any providers. No tricyclic antidepressants were selected for medication therapy.

Fifty percent of providers sampled referred depressed patients to one or more forms of alternative therapy. Aerobic exercise/weight training (consistent with cardiac rehabilitation) was prescribed most often (57.9%) followed by relaxation training (31.6%), yoga, massage therapy, and stress management (21.1%), tai chi (15.8%), and nutrition counseling and general exercise (5.3%). There was no apparent difference between NP and MD prescribing practices for alternative therapies.

**Referral to Other Providers**

Even though some respondents treated depression in the outpatient cardiology setting, almost all (94.7%, 18 = yes, 1 = no) referred patients to other providers for treatment as well. PCPs were used as a first-line referral source for 89.5% of the cardiology respondents (n=17; no response, n=2).

Sixty percent of NPs (n=3) selected mental health nurse practitioners as a secondary referral source followed by psychiatrists. One NP selected psychiatrists as a second-line referral source, and one NP respondent did not list second or third-line referral sources.

MDs who responded almost exclusively selected PCPs as their primary referral source for depression treatment (92.8%, n=13; no response, n=1). Seven MD providers
referred only to PCPs. Of the remaining six MDs who referred to more than one type of provider, all six selected psychiatrists as a second-line referral source and five selected mental health nurse practitioners as their third choice (1 = no response). In response to whether providers would consider referral of depressed patients to a comprehensive mental health program for CHD patients, the majority (63.2%) of respondents reported that they would refer at-risk patients. (The findings of Survey 1 are listed in Table 3).

Table 3. Findings from Survey 1

<table>
<thead>
<tr>
<th>Question</th>
<th>PROVIDERS REPORTING IN SURVEY 1 (N = 19)</th>
</tr>
</thead>
</table>
| Does depression exert its effects indirectly through other conventional cardiac risk factors? | 73.7% = yes (n=14)  
21.2% = no (n=4)  
5.3% = unsure (n=1) |
| Depression contributes to the prognosis of CHD.                         | 73.7% = yes (n=14)  
26.3% = no (n=5) |
| Depression is a major deterrent to making CHD risk-reducing lifestyle changes. | 100% = yes |
| Depression is an independent risk factor for CHD.                      | 31.6% = yes (n=6)  
63.2% = no (n=12)  
5.3% = unsure (n=1) |
| Do you ask your patients about depression?                              | None = 15.8% (n=3)  
1-10% = 31.6% (n=6)  
10-25% = 31.6% (n=6)  
25-50% = 15.8% (n=3) |
<table>
<thead>
<tr>
<th>Question</th>
<th>Response 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you use a standardized tool to screen for depression?</td>
<td>50-75% = 5.3% (n=1)</td>
</tr>
<tr>
<td></td>
<td>&gt; 75% = no response</td>
</tr>
<tr>
<td>Do you use a standardized tool to screen for depression?</td>
<td>100% = no (n=19)</td>
</tr>
<tr>
<td>Do you prescribe medications to treat depression?</td>
<td>42.1% = yes (n=8)</td>
</tr>
<tr>
<td></td>
<td>57.9% = no (n=11)</td>
</tr>
<tr>
<td>What is your first-line therapy for medication treatment?</td>
<td>15.8% escitalopram (n=3)</td>
</tr>
<tr>
<td></td>
<td>42.2% = “SSRIs” (n=8)</td>
</tr>
<tr>
<td></td>
<td>(not reported=11)</td>
</tr>
<tr>
<td>Do you refer your depressed patients for alternative therapy?</td>
<td>57.9% = Aerobic exercise/weight training (cardiac rehabilitation)</td>
</tr>
<tr>
<td></td>
<td>31.6% = yoga, massage therapy, and stress management</td>
</tr>
<tr>
<td></td>
<td>21.1% = tai chi</td>
</tr>
<tr>
<td></td>
<td>15.8% = nutrition counseling</td>
</tr>
<tr>
<td></td>
<td>5.3% = general exercise</td>
</tr>
<tr>
<td>Do you refer depressed patients to other providers for medication treatment?</td>
<td>94.7% = yes (n=18)</td>
</tr>
<tr>
<td></td>
<td>(89.5% of providers selected PCP as primary referral source)</td>
</tr>
<tr>
<td>Are you interested in learning how to screen patients for depression in your current practice?</td>
<td>52.6% = yes (n=10)</td>
</tr>
<tr>
<td></td>
<td>47.4% = no (n=9)</td>
</tr>
<tr>
<td>If, available, would you refer your depressed patients to a comprehensive mental health treatment program for CHD patients?</td>
<td>63.2% = yes (n=12)</td>
</tr>
<tr>
<td></td>
<td>10.5% = no (n=2)</td>
</tr>
<tr>
<td></td>
<td>10.5% = unsure (n=2)</td>
</tr>
<tr>
<td></td>
<td>15.8% = no response (n=3)</td>
</tr>
</tbody>
</table>
Aim 2

“Adapt the Patient Health Questionnaire-9 depression screening to the electronic medical record to be made available to all cardiology providers in the sample population over a designated period of time.”

When providers were asked about their interest in learning how to screen patients for depression in their practice, just over half the respondents said yes (52.6%, yes = 10; 47.4%, 9 = no). A little less than one-third of the respondents (26.3%, n=5) said they would routinely screen their patients for depression if a tool was incorporated into the EMR. The other 14 providers were evenly distributed between those who would not use the tool (36.8%, n=7) and those who were unsure (36.8%, n=7).

Adaptation of the PHQ-9 Depression Screening Tool to the EMR

The initial design of a series of templates that were formatted to the EMR system currently in use by the practice under study was completed over a three-week period by the investigator and the supervising EMR specialist for the practice. Templates in the EMR system consisted of information formatted to a series of screens that allowed for documentation of patient care. The primary goal of the template design was to ensure that the PHQ-9 screening tool and instructions for interpretation would conveniently be made available for provider use when certain patient-related symptoms were reported in the ROS at each clinic visit.

The second goal of the template design was to encourage providers to become more aware of the actual numbers of patients in their individual practices who presented with symptoms that suggested a risk for depression (i.e. anxiety, depression, nervousness,
and altered mental status, as reported in the literature review for the study). These symptoms were selected from the standard ROS check sheet that patients routinely filled out at the beginning of each clinic visit. A positive response to one or more of these symptoms would trigger a “Screen for Depression” pop up in the ROS template currently in production in the EMR. Providers would then have the choice of screening a patient for depression by selecting the “PHQ-9 Depression Screen” option (see Appendix E).

A third goal of the template design was to improve provider screening through the use of a PCP referral letter that could efficiently be generated on the ROS template. Rollman et al. (2005) used a similar method of EMR screening and PCP notification in their study to improve care for patients with anxiety disorders. By using an evidence-based screening tool in the EMR, and follow-up notification of the findings to the patient’s PCP, investigators were able to validate the diagnosis of an anxiety disorder with patients and PCPs in order to improve patient outcomes for anxiety treatment while using a collaborative care approach.

In this study, the PCP notification letter (see Appendix H) served as an alert to PCPs as to the findings of the screening with the goal of improving follow up with at-risk patients for treatment and monitoring. Once generated, the letter would be faxed by medical records team members to individual PCPs at the end of each clinic day. This option was considered very important because cardiology providers may have previously elected not to screen patients for depression if it was believed that they would be primarily responsible for treating depression and monitoring therapy.
A fourth goal of the template design was to ensure ease and simplicity of use so that busy providers and MAs with varying levels of experience could screen patients in less than two minutes during a routine outpatient clinic visit. Templates were formatted to encourage providers to screen at-risk patients through the use of electronic pop up reminders in the ROS section of the EMR. However after the completion of the trial, it was believed that MAs would likely be completing the majority of depression screenings.

Prior to uploading the screening templates, an email notification was sent to all providers informing them about the upcoming screening program available in the EMR. The screening program was presented to the providers as an “optional” tool for improving patient outcomes and that screening usually took no more than two minutes to complete. Providers were also informed that the templates would be available only during the trial, and that permanent placement in the EMR would be based on provider preferences in order to support group representation for clinical decision-making in the sample practice.

**Findings from the EMR Trial**

After one week of provider exposure to the depression screening template in the EMR, template use reports were run electronically to generate data on use patterns. One thousand four hundred and thirteen eligible patients were believed to have been exposed to the written ROS check sheet that each patient was asked to fill out when checking in before each clinic visit. No patients reported having altered mental status. Sixty-eight patients reported anxiety, 91 patients reported depression, and 36 patients reported
nervousness. Provider use reports for the depression screening template showed that no providers accessed the template during the initial week of the trial.

At the end of Week 2, providers saw 2,023 patients that were believed to have been exposed to the written ROS check sheet provided at clinic check-in. Of these patients, 118 reported having anxiety, 156 reported being depressed, and 41 reported some perception of nervousness. No patients reported having altered mental status. In the two-week screening period, a total of 510 patients had reported symptoms consistent with depression. Of those patients, only four were subsequently screened for depression by one provider during Week 2. The findings from the EMR trial are summarized in Table 4.
Table 4. *Number of Patients with Documented Screening Symptoms in the EMR*

<table>
<thead>
<tr>
<th></th>
<th>WEEK 1 NUMBER OF ELIGIBLE PATIENTS FOR SCREENING (N = 1,413)</th>
<th>WEEK 2 NUMBER OF ELIGIBLE PATIENTS FOR SCREENING (N = 2,023)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>91</td>
<td>156</td>
</tr>
<tr>
<td>Anxiety</td>
<td>68</td>
<td>118</td>
</tr>
<tr>
<td>Nervousness</td>
<td>36</td>
<td>41</td>
</tr>
<tr>
<td>Altered Mental Status</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Number of Patients with Potential for Depression</strong></td>
<td><strong>195</strong></td>
<td><strong>315</strong></td>
</tr>
<tr>
<td><strong>Total Number of Patients Screened for Depression by Providers</strong></td>
<td><strong>0</strong></td>
<td><strong>4</strong></td>
</tr>
</tbody>
</table>

**Aim 3**

“Evaluate the effectiveness of exposure to a depression screening tool in the sample population by administering the *Survey 2 of Depression Treatment in Outpatient Cardiology Practice* tool after a designated period of time.”

**Results from Survey 2**

Surveys were distributed in the same format as that used in Survey 1. During the survey distribution process, one provider asked why depression screening should be considered a part of cardiology care. Another provider said that he had not seen the “Screen for Depression” pop-up in the ROS.
A limited number of providers (n=10) responded to the follow-up survey after a two-week exposure to the depression screening tool in the EMR. To improve survey response, two email reminders were sent to all providers, their MAs, and the four main clinic office managers during the ten-day survey completion period. However, the number of returned surveys was 47.4% less than the response received in the initial survey (see Table 5).

Table 5. Participating Providers in the 2 Surveys

<table>
<thead>
<tr>
<th>PARTICIPATING PROVIDERS</th>
<th>SURVEY 1</th>
<th>SURVEY 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPs (n= 9)</td>
<td>55.5% (n = 5)</td>
<td>--</td>
</tr>
<tr>
<td>MDs (n= 26)</td>
<td>53.8% (n = 14)</td>
<td>--</td>
</tr>
<tr>
<td>Unspecified Providers (n=35)</td>
<td>--</td>
<td>28.6% (n = 10)</td>
</tr>
</tbody>
</table>

In response to “Did you complete the first survey?”, seven providers answered “yes” and three providers answered “no”. All provider respondents answered “no” to the question “Do you use a standardized screening tool to diagnose depression?”. When asked “Why not?”, four providers did not respond. The six providers who did respond wrote the following comments:

1. “Deferred to PCP. In my 5-10 minute/pt I have a laundry list of other issues to address.”
2. “?”
3. “Not making the time.”
4. “I don’t want to.”
5. “Didn’t know about it.”
One provider suggested that the screening be completed by the MA when rooming patients for providers. This was believed to be related to the idea that completing depression screenings before providers actually begin a patient visit could potentially decrease overall clinic appointment times while still screening patients at risk.

A similar written comment was also made by a provider and was attached to an initial survey completed before the EMR trial. The provider stated the following:

Although I would love to do depression screen and treatment, its hard to cram all of this into a 10 min visit. However – if care pathways could be created to screen - administered by MA’s in select pts – with avenues for referrals this would be welcomed.

In Survey 2, one provider commented that the reason for not screening patients at risk for depression was related to “Not making the time” during a clinic visit. A secondary analysis of time scheduled for patient visits by providers was performed to understand how providers allotted time for patient visits in the sample practice. Scheduled intervals for patient visits by providers in the sample practice (n=25) ranged from five to 20 minutes ($M = 12.76, SD = 3.37$) depending on individual provider preference. The largest number of physicians scheduled patient visits every 15 minute visits (52%, n=13) followed by those providers who scheduled visits every ten minutes (32%, n=8). For NPs (n=6), appointments ranged from seven to 20 minutes. NP visits averaged 14.5 minutes ($SD = 5.24$) with the largest number scheduling between 15 and 20 minutes (16%, n=4).
Summary

Even though the majority of providers who responded in the sample under study believed that depression does contribute to the progression of CHD in multiple ways, the findings showed an overarching lack of desire and allotted time to perform depression screening for case-finding and initiate interventional treatment for depression. Lack of engagement in depression care by cardiology providers has the potential to negatively impact health outcomes for at-risk CHD patients.
CHAPTER V
DISCUSSION

A variety of evidence-based guidelines for the screening and treatment of depression have been nationally recognized for use in improving depression care (Agency for Healthcare Research and Quality, 2010; American College of Physicians, 2010; American Psychiatric Association, 2010). Even though the use of clinical practice guidelines that support EBP has been shown to improve care quality, decrease variability in patient care, and reduce healthcare costs; many providers continue to resist changes in longstanding practice patterns that incorporate individual clinical decision-making and personal beliefs about depression care (Alemi, Haack, & Nemes, 2001; Garcia et al., 2008).

How Can Depression Care be Improved in Outpatient Cardiology Practice?

Current trends for improving quality outcomes for depression care are focused on the use of evidence-based practice that can promote overall patient health and quality of life while decreasing the economic burden that is often associated with marginally managing depression (especially within the context of CHD) (Garson, Engelhard, & Lewin, 2010; Gelenberg et al., 2010; Qaseem, Snow, Denberg, Forcier, & Owens, 2008). Multiple influences that determine the effective application of EBP guidelines for screening and treating depression by providers in outpatient care are often focused on individual provider decision-making strategies, interactions between providers in group practice, and organizational factors that may either inhibit or improve compliance.
(Gurses, Marsteller, Ant Okzok, Xiao, Owens, & Pronovost, 2010; Beaudin et al., 2004; Rothman & Wagner, 2003). The findings in this study support those three constructs.

**Individual Decision-making Influences on Provision of Care.**

**The Physician**

In recent years, the reported rate for physician provider compliance in the use of EBP recommended therapies for all diagnoses (including screening and treatment) has been estimated at 50% and has increased by only 3% since 1998 (U.S. Department of Health and Human Services, 2008). Reasons for poor compliance with EBP and clinical practice guidelines (CPGs) by physician providers have centered around lack of individual provider knowledge and decision-making strategies with regard to EBP guidelines, lack of provider agreement regarding correctness and fit of guidelines for practice, and inability of providers to effectively implement best-practice guidelines at the organizational level (Cabana et al., 1999; Pronovost, Angus, Dorman, Robinson, Dremsizov, & Young, 2002; Rollman, Weinreb, Korsen, & Schulberg, 2006).

In 1999, Cabana et al. formulated a well-known framework for explaining why physicians do not routinely comply with evidence-based guidelines. This framework has been used in numerous studies and reports since then to further attempt to understand factors surrounding poor compliance (Audet, Doty, Shamasdin, & Schoenbaum, 2005; Cabana & Kim, 2003; Cabana et al., 1999; Cahill, Suurdt, Ouellette-Kuntz, & Heyland, 2010; Erhardt, 2005; Osser, 2006).

Cabana et al., (1999) posited that physicians are often unsure as to whether compliance with EBP guidelines in routine practice will truly enhance clinical outcomes.
Limited time to access and interpret guidelines, concern about performing guideline recommendations, inertia from routines and habits in the daily performance of care, and the economics of outpatient reimbursement can concomitantly influence effective application of EBP for depression screening and treatment for CHD patients.

**Beliefs regarding Depression and CHD**

Limitations in knowledge regarding care plans for specific conditions and understanding about EBP guideline recommendations can lead to inaction when providers are faced with decision-making for interventional treatment during outpatient care visits (Greene et al., 2004). It is highly probable that providers who receive focused comprehensive continuing education on depression care will screen for depression and provide treatment at a higher rate (Bloom, 2005; Marinopoulos, et al., 2007; Moore, Cervero, & Fox, 2007; Yeung, Overstreet, & Albert, 2007). Because the prevalence of depressive disorders is higher in patients with CHD, continuing education in techniques for depression screening, psychopharmacology and alternative care for depressive disorders should be undertaken by all providers who care for cardiac patients.

Whitby, McLaws, and Ross (2006) suggested that physician’s attitudes regarding compliance with EBP guidelines are directly related to how they positively or negatively value guideline recommendations and their individual desire to carry out these recommendations. This finding is identified in one individual provider response from Survey 2 reported in the current study (“I don’t want to”). Further study is necessary to understand if other cardiology providers in similar outpatient settings believe that
completion of depression screening and treatment is or should be an integral part of improving patient outcomes in CHD care.

**Busyness in Practice**

In the past, multiple researchers have reported that decreased time spent with patients in outpatient visits reduces exposure to preventive care and screening for illness (Bodenheimer, Wagner, & Grumbach, 2002; Davidoff, 1997; Dugdale, Epstein, & Pantilat, 1999; Lin et al., 2001; Streja, & Rabkin, 1999; Zyzanski, Stange, Langa, & Flocke, 1998). Recently, Smolders et al., (2010) similarly found that lack of time to specifically address depression was a major barrier to effective depression care in outpatient practice.

Provider comments in Survey 2 alluded to the idea that level of busyness in practice is of concern when considering depression care. One provider stated that patient visits in her/his practice are often limited to a very short time frame for accomplishing multiple tasks. (“In my 5-10 minute/pt I have a laundry list of other issues to address.”). This statement brings forth concerns as to the quality, amount, and types of care that can be accomplished in such a brief exchange.

In a study of time allocation in outpatient practice, Tai-Seale, McGuire, and Zhang (2007) reported that the majority of time spent by providers in outpatient clinic visits is often focused on the discussion of biomedical issues (72%). Discussion of mental health issues was limited to less than three percent (2.9%). The researchers further noted that patient talk-time regarding biomedical issues was significantly less (85%, \( p < .01 \)) than talk-time engaged in mental health issues, and that biomedical talk-
time took precedence over discussions about mental health issues (27% less time on mental health than biomedical, p < .01). When mental health issues were a primary topic of clinic visits, discussions lasted 37% longer than biomedical issues. Because mental health issues often take longer to discuss and can result in extended appointment times, cardiology providers may not want to bring up the topic of depression in order to avoid falling behind on tightly scheduled clinic visits. Further research is needed to determine if visits less than 15-20 minutes in length are adequately sufficient to facilitate comprehensive and effective exchange of information between cardiology providers and their patients in order to ensure quality outcomes.

**Practice Inertia**

The use of organized support systems such as screening and treatment reminders in the EMR has the potential to improve care delivery. In a systematic review of 23 studies, Grilli and Lomas (1994) reported that presenting uncomplicated guidelines in a simple and easy-to-use format was more likely to produce higher compliance rates among providers. However, this finding was not noted in the current study in which easy-to-use templates that were efficiently accessible to providers in the EMR were rarely accessed for patient care. Further study is required is see if longer exposure to optional reminders in the EMR will improve interventional screening and treatment of depression versus the use of template designs that force completion of recommended EBP practices by requiring completion of screenings electronically in order for providers to move along in the EMR charting sequence.
The economic burden for depressive disorders in the US is estimated at over $87 billion dollars annually (Qaseem et al., 2008). Improving adherence to guidelines for depression screening and treatment by cardiology providers has the potential to greatly improve national cost-containment in the treatment of CHD patients. Recently, pay for performance has been brought forth as a model for national health care reform to decrease the overall burden of healthcare costs in the United States. Traditional fee for service reimbursement currently in use in the US supports a time and motion model for outpatient care where providers are rewarded for number of patients seen. The pay for performance model is designed to reimburse providers with financial incentives that are earned on the basis of care quality. Part of the formula for determining care quality will likely focus on appropriate use of evidence-based guidelines in practice (Qaseem et al., 2010), which could ultimately enhance care quality for CHD patients with depression.

Comparison of Survey 1 Findings to the 2006 Feinstein Survey

In an attempt to understand if general beliefs about depression and CHD, and practices in outpatient cardiology depression care may have occurred since the 2008 American Heart Association science advisory (Litchman et al., 2008), results of specific Survey 1 questions previously presented to a large sample of cardiovascular physicians in a national survey reported by Feinstein et al. in 2006 were compared to findings of Survey 1. In the Feinstein et al. study, 70.5% of those physicians who responded believed that depression exerted its effects indirectly through other conventional cardiac risk factors. Similar results were noted in the current survey (73.7%). However, a
slightly smaller percentage of providers in the current study believed that depression contributed to the prognosis of CAD (current study = 73.7%, Feinstein et al. = 88.8%). Virtually all providers in both surveys felt that depression is a major deterrent to making CHD risk-reducing lifestyle changes (Feinstein et al., = 97.2%; Survey 1 = 100%).

In the 2006 study, more cardiology providers (49.9%) believed that depression was an independent risk factor for CAD as compared to cardiology respondents in the current study (31.6%). The highest percentage of providers (29.6%) in the 2006 study asked their patients about depression 10-25% of the time. Similarly, the majority of patients seen by providers in the current study were also asked about depressive symptoms less than 25% of the time (31.6%).

Twenty-one percent of providers in the 2006 study used standardized criteria to screen patients for depression; none of those providers who responded to Survey 1 in the current study reported using any formal tools for screening. Finally, in the Feinstein et al. (2006) survey, 55.7% of providers reported treating their patients with medications, whereas slightly fewer respondents (42.1%) in the current study initiated antidepressant medication therapy for their patients. Providers in both samples agreed that SSRIs were first-line therapy for interventional treatment. (The findings are summarized in Table 6). Even though the findings in the two studies cannot be directly compared due to lack of generalizability and small sample size in the current study, provider practices reported in the current study do not appear to be fully moving towards EBP recommendations for CHD-related depression care recently published by the American Heart Association.
advisory council (Litchman et al., 2008). The findings of the two surveys are compared in Table 6.
Table 6. Comparisons between Cardiology Provider Practices in 2 Studies

<table>
<thead>
<tr>
<th></th>
<th>PROVIDERS IN FEINSTEIN ET AL., 2006 STUDY (N = 796)</th>
<th>PROVIDERS REPORTING IN SURVEY 1 (N = 19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does depression exert its effects indirectly through other conventional cardiac risk factors?</td>
<td>70.5% = yes (n=561) 12.6% = no (n=100) 16% = unsure (n=128)</td>
<td>73.7% = yes (n=14) 21.2% = no (n=4) 5.3% = unsure (n=1)</td>
</tr>
<tr>
<td>Depression contributes to the prognosis of CHD.</td>
<td>88.8% = yes (n=691 of 778)</td>
<td>73.7% = yes (n=14) 26.3% = no (n=5)</td>
</tr>
<tr>
<td>Depression is a major deterrent to making CHD risk-reducing lifestyle changes.</td>
<td>97.2% = yes (n=768 of 790)</td>
<td>100% = yes</td>
</tr>
<tr>
<td>Depression is an independent risk factor for CHD.</td>
<td>49.9% = yes (n=397) 32.5% = no (n=255) 17.5% = unsure (n=139)</td>
<td>31.6% = yes (n=6) 63.2% = no (n=12) 5.3% = unsure (n=1)</td>
</tr>
<tr>
<td>Do you ask your patients about depression?</td>
<td>None = 6.8% (n=54) 1-10% = 24.5% (n=195) 10-25% = 29.6% (n=236) 25-50% = 17.1% (n=136) 50-75% = 10.7% (n=85) &gt; 75% = 8.5% (n=68)</td>
<td>None = 15.8% (n=3) 1-10% = 31.6% (n=6) 10-25% = 31.6% (n=6) 25-50% = 15.8% (n=3) 50-75% = 5.3% (n=1) &gt; 75% = no response</td>
</tr>
<tr>
<td>Do you use a standardized tool to screen for depression?</td>
<td>79% = yes (n=585 of 741))</td>
<td>100% = no (n=19)</td>
</tr>
<tr>
<td>Do you prescribe medications to treat depression?</td>
<td>55.7% = yes (n=not reported)</td>
<td>42.1% = yes (n=8) 57.9% = no (n=11)</td>
</tr>
<tr>
<td>What is your first-line therapy for medication treatment?</td>
<td>28% = sertraline (n=not reported) 71.5% = “SSRIs” (n=not reported)</td>
<td>15.8% escitalopram (n=3) 42.2% = “SSRIs” (n=8; not reported=11)</td>
</tr>
</tbody>
</table>
Influences of Multidisciplinary Care in Group Practice

The Nurse Practitioner

Advanced practice nurses (NPs) have completed extensive education that uniquely integrates treatment of medical and psychological morbidities using biopsychosocial and holistic principles of interventional care to improve patient outcomes. Integrating biopsychosocial principles of care in relation to depression includes observation for physical and psychological distress indicative of depression, screening for depression, and use of pharmacologic and cognitive behavioral therapies to assist patients in improving health outcomes (Lyles et al., 2003; Mead, Bower, & Gask, 1997; Mundinger, 2002).

NPs are also educated to care for patients using an evidence-based framework for practice that integrates the most current best evidence with individual patient beliefs and values that are traditionally formed through lifelong exposure to experiential biopsychosocial, environmental, spiritual, and economic factors (Michaels, McEwen, & McArthur, 2008). Numerous studies examining the roles of NPs have shown that the use of a biopsychosocial NP model of care can significantly improve patient outcomes (Ansari et al., 2003; Herrmann & Zabramski, 2005; Hoffman, Tasota, Saharfenberg, Zullo, & Donahoe, 2003; Jackson, Lee, Edelman, Weinberger, & Yano, 2011; Paez & Allen, 2006; Van Nes & Swatzky, 2010).

Fundamental patterns of care provided by all NPs include primary, secondary, and tertiary prevention strategies to alleviate, minimize, or stop the progression of illness (Porche, 2004). Depression screening and treatment in outpatient cardiology practice
includes both secondary and tertiary prevention strategies to improve early case finding and in-clinic treatment or referral to decrease overall morbidity and mortality in CHD patients.

**NP Practice Regarding Depression Care in the Current Study**

A concerning finding in the current study showed that NPs who responded did not consistently report patient care practices routinely included in secondary and tertiary prevention based on a best-practice model for depression care. One reason for this may lie in the collaborative relationships formed by NPs and MDs in outpatient practices where NPs are directly hired by their collaborating MDs. NPs may feel obligated or restricted to practice within a traditional hierarchical medical model that is often defined by individual physician judgment where care is initiated and measured by patient outcomes associated with complications of illness and prevention of mortality (Brook, McGlynn, & Cleary, 1996; Garcia et al., 2008). This model often limits performance of all providers in contemporary healthcare and does not support the diffusion of creative and innovative practice to improve patient outcomes (DeBourgh, 2001). Further study to understand the relationships between collaborative physician/NP practice models of care is necessary to determine if there is a change in NP practice toward a medical model when NPs work directly under specialty physicians.

**Enlisting Advance Practice Nurses to Improve Care**

Advanced practice nurses have been consistently instrumental in developing and managing performance-enhancing processes that improve care quality and patient outcomes. As nursing practice leaders, NPs have an obligation to be progressive in
promoting best-practice through the application of evidence-based guidelines (Debourgh, 2001; Garcia et al., 2008).

In a study demonstrating applied NP leadership, nurse practitioners were asked to assist with EBP by improving CPG compliance and conformity in a large inpatient hospital setting. Using a multidisciplinary approach, NPs developed a program for initiating care and monitoring compliance, noncompliance, and conformity (correction of a noncompliant plan of care to a corrected plan of care) to pre-determined CPGs using tracking data recorded in the EMR. NPs in this study were also responsible for initial education and follow-up for providers regarding CPGs. At the end of the trial, compliance rates improved from 93%, 51%, and 67% to 99%, 97%, and 97.6% respectively with regard to three specific CPGs for patient care (Garcia et al., 2008).

A similar model of care to improve application of EBP for depression screening and treatment/referral can easily be adapted to outpatient the cardiology clinic setting. With appropriate monetary compensation for expanded practice requirements, select NPs could act as change agents and assume leadership roles to educate and oversee compliance and conforming practice by all providers. NPs working within an organization could possibly have greater influence with other staff members and have access to all resources necessary to ensure that all patients who presented with symptoms consistent with depression received appropriate screening and treatment or referral.

**Organizational Influences on Provision of Depression Care**

Multiple studies and reports have demonstrated that missed opportunities for provision of quality care in outpatient settings are often related to organizational factors
as well as individual provider practices (Berwick, 2002; Hung et al., 2006; Rothman & Wagner, 2003; Woolf, & Atkins, 2001). The effect of outcomes in patient care can be influenced by multiple factors at the organizational level including levels of provider autonomy (Waddimba, Meterko, Beckman, Young, & Burgess 2010), types and quality of working relationships between providers (Brett, 2000), and level of staff involvement in practice decision making (Hung et al., 2006).

Providers in the current sample practiced autonomously within a group practice setting which may have negatively influenced individual buy-in for EBP compliance. Waddimba et al. (2010) found that providers who perceived themselves as autonomous within a multiple provider practice setting often showed lower adherence to practice guidelines. This finding was believed to be related to the possibility that autonomous providers might have greater perceived confidence in their individual knowledge and skills resulting in a decreased desire and effort to comply with EBP guidelines.

Posits of the Organizational Change Manager Model (Molfenter, Gustafson, Kilo, Bhattacharya, & Olsson. 2005) encompass the concept of enlisting strong opinion leaders in a system (select providers in an outpatient cardiology setting) to improve organizational outcomes. These opinion leaders are often at the forefront of change within an organization (influencing provider use of new care strategies). Opinion leaders can facilitate movement of bench research into practice by increasing awareness among providers and promoting buy-in for change in practice (Rogers, 2003). In traditional physician-owned practices, these leaders are often MDs. However NPs have also been viewed as innovative opinion leaders based on their abilities to care for patients using a
holistic care model, motivate and educate staff members, and influence change within an organization (Garcia et al., 2008).

Two providers in the study sample suggested that MAs could be assigned to screen patients at high risk for depression while completing initial check-in tasks before seeing providers at outpatient visits. The use of non-professional health care assistants (MAs) to perform preventive screenings for health behaviors (depression screening) using formal clinical information systems (the EMR) has been shown to improve overall patient outcomes (Casalino et al., 2003; Hung et al., 2006) while maximizing limited time available for patient appointments.

NPs practicing in outpatient cardiology settings are in an excellent position to facilitate training and education of MAs with regard to accuracy in screening techniques and assisting providers to ensure PCP notification for at-risk patients.

**Strengths and Limitations of the Study**

The primary strength of this study was noted in the depth and size of the cardiology practice which encompassed multi-site clinics and a large number of cardiology providers made up of both NPs and MDs. A second strength of the study was the pre-test/post-test design which allowed for comparison of behaviors before and after an intervention. Lastly, innovative incorporation of the intervention into an existing EMR system allowed for efficient and comprehensive implementation of screening and referral tools and evaluation of practice behaviors.

The results of this preliminary study on outpatient care of depression by cardiology providers were limited by marginal survey response rates in Survey 1 (n=19)
and low response rates in Survey 2 (n=10). Results of the study are interpreted from one cardiology practice and cannot be generalized to other cardiology practice environments. Even though multiple attempts were made to contact and notify all providers personally, through email communications, and through updates to individual provider MAs and office managers during the study, it was possible that information regarding the study did not get fully disseminated to providers. Busy providers may have been out of the clinic setting during data collection, failed to routinely check their email, or chosen to view the completion of surveys and screenings as a low priority which could have impacted the findings of the study.

Providers were intentionally minimally educated on the depression screening tool so as to not influence current provider practice with regard to depression care while the surveys were being completed. More comprehensive provider education on the use of the screening tool and the depression screening template in the EMR prior to uploading the template into the EMR may have improved use of the tool.

The duration of exposure time to the screening tool in the EMR was admittedly short and may have had a significant impact on the findings of the study. It is possible that as time passed, providers may have been more comfortable with attempting to use the tool simply because of exposure to the pop-up reminders in the EMR.

Some providers practiced in more that one clinic site for outpatient appointments. All major clinic sites were supplied with survey collection boxes in order to facilitate survey collection. Even so, some providers could have been confused as to where to deposit surveys and neglected to turn them in. Finally, inferences as to specific
causal behaviors of NP and MD practice cannot be assumed to be clearly accurate and must only be viewed in relationship to possible causal patterns.

**Future Directions for Depression Care in Outpatient Cardiology**

Within the past forty years, hundreds of studies have reported a clear relationship between CHD and increased incidence for depressive disorders yet little has been accomplished regarding routine screening and treatment for depression by cardiology providers. It is clear that practice behaviors regarding depression care must be incorporated into routine outpatient cardiology practice without further consideration. Outpatient care for depression in cardiology clinics may need to be linked to pay for performance reimbursement as determined by adherence to quality care guidelines in order to get providers to consider depression care as part of routine cardiology practice.

All cardiology providers should participate in continuing education programs to improve skills and confidence with regard to depression screening and treatment or appropriate referrals. Part of routine outpatient cardiology care should also include incorporation of alternative therapies that encompass mind-body supportive interventions to improve outcomes for depressed patients with CHD. Finally, NPs can be at the forefront of improving patient outcomes by acting as change agents for improving depression care in outpatient cardiology practice.

**Conclusions**

In this study, important issues were identified in relation to NP and MD cardiology provider beliefs about the influences of depression on CHD, screening and treatment practices for depression care, and perceived limitations for depression
screening and treatment by cardiology providers in general that may be pervasive in current outpatient cardiology care. Even though a scientific advisory committee from the American Heart Association (with endorsement from the American Psychiatric Association) (Lichtman et al., 2008) recently recommended that patients with CHD be routinely screened and treated for depression if indicated as part of a best-practice approach to care, it is questionable as to whether these recommendations are filtering down to outpatient cardiology practice. Further studies to validate causal relationships between lack of depression screening and care and cardiology provider beliefs regarding depression care are warranted. Provider education to improve confidence with depression screening and treatment practice and provision of concise easy-to-use templates in cardiology outpatient EMR systems may help to improve overall patient outcomes with regard to high quality interventional depression care for patients with CHD.

Patient care needs are the driving factor behind enhancing provider competencies for both NPs and MDs. Providers are obligated by professional codes of conduct to provide care that is evidenced based and does not rely on personal preference (DeBroug, 2001), time and motion performance, or lack of treatment knowledge. Enlisting the skills of NPs with extensive knowledge of science-based practice combined with humanistic caring in outpatient cardiology practice is viewed as crucial to improving depression screening and treatment outcomes for CHD patients.
APPENDIX A: SURVEY 1
Survey 1 of Depression Treatment in Outpatient Cardiology Practice

1. Do you believe that depression exerts its effects indirectly through other conventional cardiac risk factors?
   Yes    No

2. Do you believe that depression contributes to the prognosis of CHD?
   Yes    No

3. Do you believe that depression contributes to the patient’s inability to make lifestyle changes?
   Yes    No

4. Do you believe that depression contributes to the patient’s non-adherence to medication therapy?
   Yes    No

5. Do you believe that depression is an independent risk factor for CHD?
   Yes    No

6. What percentage of your CHD patients do you ask about symptoms of depression?
   (Please circle your answer)

<table>
<thead>
<tr>
<th>Percentage</th>
<th>25-50%</th>
<th>50-75%</th>
<th>75-100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1-10%</td>
<td>10-25%</td>
<td></td>
</tr>
</tbody>
</table>

7. Do you feel comfortable about making a diagnosis of depression?
   Yes    No

8. Do you use a standardized screening tool to diagnose depression?
   Yes    No

9. What is the name of the tool? ____________________________
10. If not, how do you diagnose depression? (Please circle all that apply)

Clinical judgment  Patient report  Family report

Other_______________________ (please specify)

10. Do you prescribe antidepressants for your patients?

Yes          No

11. If so, which of the following do you prescribe? (Please circle all that Apply)

   Tricyclic antidepressants
   Selective serotonin reuptake inhibitors (Prozac, Paxil, Zoloft, Lexapro, Celexa)
   Selective norepinephrine uptake inhibitors (Effexor, Effexor XR, Pristiq, Cymbalta)
   Atypical antidepressants (Wellbutrin)

12. Of the above medications, which is your first-line therapy?

   Medication = __________________________

13. Do you refer depressed patients to other providers for medication treatment?

   Yes          No

14. If so please rank the providers below in order of first to last choice. (1 to 3)

   Primary Care Provider          ____
   Psychiatrist                    ____
   Mental Health Nurse Practitioner _____

15. Do you refer your depressed patients for alternative therapy? (Please circle all that apply)
Aerobic Exercise/Weight training
Relaxation training
Massage therapy
Stress management
Psychotherapy (psychologist social worker counselor)
Daily journaling
Acupressure/acupuncture therapy
Tai chi
Yoga
Other ____________________________  None _______

16. Are you interested in learning how to screen patients for depression in your current practice?

Yes       No

17. Are you interested in learning how to effectively prescribe antidepressants in your current practice?

Yes       No

18. If a depression screening tool was incorporated into the electronic medical record, would you routinely screen your patients for depression?

Yes       No

19. If available, would you refer your depressed patients to a comprehensive mental health treatment program for CHD patients?

Yes       No

20. Are you an MD     NP     Years in Practice _____
Thank you for completing this survey. Place the survey in the envelope provided and seal the envelope. Please return it to your office manager at your earliest convenience.

Mary Beth Lochner RN, MSN, FNP-C
Doctoral Candidate, The University of Arizona, College of Nursing

(Survey adapted with permission from Feinstein et al. (2006). A national survey of cardiovascular physicians’ beliefs and clinical care practices when diagnosing and treating depression in patients with cardiovascular disease. Cardiology in Review, 14, 164-169.)
APPENDIX B: SURVEY 2

Survey 2 of Depression Treatment in Outpatient Cardiology Practice
1. Did you complete the first survey?
   Yes          No

2. Do you use a standardized screening tool to diagnose depression?
   Yes          No

   If Your answer is no – why not? ______________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________

   (If you answered no to question 2, you have) completed the survey. Please enclose in envelope and return to depression survey box as instructed

   (If you answered yes to question 2, please) continue the survey

2. What is the name of the tool? ______________________________

3. Do you believe that depression exerts its effects indirectly through other conventional cardiac risk factors?
   Yes          No

4. Do you believe that depression contributes to the prognosis of CHD?
   Yes          No
5. Do you believe that depression contributes to the patient’s inability to make lifestyle changes?
   Yes          No

6. Do you believe that depression contributes to the patient’s non-adherence to medication therapy?
   Yes          No

7. Do you believe that depression is an independent risk factor for CHD?
   Yes          No

8. What percentage of your CHD patients do you ask about symptoms of depression?
   (Please circle your answer)

   None                     25-50%
   1-10%                    50-75%
   10-25%                  75-100%

9. Do you feel comfortable about making a diagnosis of depression?
   Yes          No

10. Do you prescribe antidepressants for your patients?
   Yes          No

11. If so, which of the following do you prescribe? (Please circle all that Apply)
    Tricyclic antidepressants
    Selective serotonin reuptake inhibitors  (Prozac, Paxil, Zoloft, Lexapro, Celexa)
    Selective norepinephrine uptake inhibitors  (Effexor, Effexor XR, Pristiq, Cymbalta)
    Atypical antidepressants  (Wellbutrin)

12. Of the above medications, which is your first-line therapy?
    Medication = __________________________
13. Do you refer depressed patients to other providers for medication treatment?
   Yes          No

14. If so please rank the providers below in order of first to last choice. (1 to 3)
   
   Primary Care Provider       ______
   Psychiatrist                  ______
   Mental Health Nurse Practitioner  ______

15. Do you refer your depressed patients for alternative therapy? (Please circle all that apply)
   
   Aerobic Exercise/Weight training
   Relaxation training
   Massage therapy
   Stress management
   Psychotherapy (psychologist social worker counselor)
   Daily journaling
   Acupressure/acupuncture therapy
   Tai chi
   Yoga
   Other ____________________________  None _______

16. Are you interested in learning how to screen patients for depression in your current practice?
   Yes          No

17. Are you interested in learning how to effectively prescribe antidepressants in your current practice?
   Yes          No
18. If a depression screening tool was incorporated into the electronic medical record, would you routinely screen your patients for depression?

Yes  No

19. If available, would you refer your depressed patients to a comprehensive mental health treatment program for CHD patients?

Yes  No

20. Are you an MD _____ NP _____ Years in Practice _____

Thank you for completing this survey. Place the survey in the envelope provided and seal the envelope. Please return it to your office manager or place in survey box at your earliest convenience.

Mary Beth Lochner RN, MSN, FNP-C
Doctoral Candidate, The University of Arizona, College of Nursing

(Survey adapted with permission from Feinstein et al. (2006). A national survey of cardiovascular physicians’ beliefs and clinical care practices when diagnosing and treating depression in patients with cardiovascular disease. Cardiology in Review, 14, 164-169.)
APPENDIX C: PHQ-9 DEPRESSION SCREENING TOOL
### Patient Health Questionnaire-9 (PHQ-9)

Over the last 2 weeks, how often have you been bothered by any of the following problems? (Use "✓" to indicate your answer)

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Several days</th>
<th>More than half the days</th>
<th>Nearly every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Little interest or pleasure in doing things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Feeling down, depressed, or hopeless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Trouble falling or staying asleep, or sleeping too much</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Feeling tired or having little energy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Poor appetite or overeating</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Trouble concentrating on things, such as reading the newspaper or watching television</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. Thoughts that you would be better off dead or of hurting yourself in some way</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**For Office Coding:**

\[
\text{Score} = 0 + \text{Score} + \text{Score} + \text{Score}
\]

**Total Score:**

---

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

<table>
<thead>
<tr>
<th>Not difficult at all</th>
<th>Somewhat difficult</th>
<th>Very difficult</th>
<th>Extremely difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

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Developed by Drs. Robert L. Spitzer, Janet B.W. Williams, Kurt Kroenke and colleagues, with an educational grant from Pfizer Inc. No permission required to reproduce, translate, display or distribute.
PATIENT HEALTH QUESTIONNAIRE PHQ-9 FOR DEPRESSION

USING PHQ-9 DIAGNOSIS AND SCORE FOR INITIAL TREATMENT SELECTION

A depression diagnosis that warrants treatment or treatment change, needs at least one of the first two questions endorsed as positive (little pleasure, feeling depressed) indicating the symptom has been present more than half the time in the past two weeks.

In addition, the tenth question about difficulty at work or home or getting along with others should be answered at least "somewhat difficult".

When a depression diagnosis has been made, patient preferences should be considered, especially when choosing between treatment recommendations of antidepressant treatment and psychotherapy.

<table>
<thead>
<tr>
<th>PHQ-9 Score</th>
<th>Provisional Diagnosis</th>
<th>Treatment Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-9</td>
<td>Minimal symptoms*</td>
<td>Support, educate to call if worse; return in 1 month.</td>
</tr>
<tr>
<td>10-14</td>
<td>Minor depression ††</td>
<td>Support, watchful waiting</td>
</tr>
<tr>
<td></td>
<td>Dysthymia*</td>
<td>Antidepressant or psychotherapy</td>
</tr>
<tr>
<td></td>
<td>Major depression, mild</td>
<td>Antidepressant or psychotherapy</td>
</tr>
<tr>
<td>15-19</td>
<td>Major depression, moderately severe</td>
<td>Antidepressant or psychotherapy</td>
</tr>
<tr>
<td>≥ 20</td>
<td>Major depression, severe</td>
<td>Antidepressant and psychotherapy (especially if not improved on monotherapy)</td>
</tr>
</tbody>
</table>

* If symptoms present ≥ two years, then probable chronic depression which warrants antidepressant or psychotherapy (ask, "In the past 2 years have you felt depressed or sad most days, even if you felt okay sometimes?").

†† If symptoms present ≥ one month or severe functional impairment, consider active treatment.

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APPENDIX E: EMR “SCREEN FOR DEPRESSION” TEMPLATE
APPENDIX F: EMR PHQ-9 SCREENING TEMPLATE
**PHQ-9 Depression Screen**

Ask the patient "over the last two weeks how often have you been bothered by"

<table>
<thead>
<tr>
<th></th>
<th>Not At All</th>
<th>Several Days</th>
<th>More Than Half The Days</th>
<th>Nearly Every Day</th>
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<td>〇</td>
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<tr>
<td>2. Feeling down, depressed, or hopeless</td>
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<td>〇</td>
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<td>〇</td>
</tr>
<tr>
<td>3. Trouble falling or staying asleep, or sleeping too much</td>
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<td>〇</td>
<td>〇</td>
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<tr>
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<td>〇</td>
<td>〇</td>
<td>〇</td>
</tr>
<tr>
<td>5. Poor appetite or overeating</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
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<tr>
<td>6. Feeling bad about yourself - or that you are a failure or have let yourself or your family down</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
</tr>
<tr>
<td>7. Trouble concentrating on things, such as reading the newspaper or watching television</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
</tr>
<tr>
<td>8. Moving or speaking so slowly that other people could have noticed? Or the opposite - being so fidgety restless that you have been moving around a lot more than usual</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
</tr>
<tr>
<td>9. Thoughts that you would be better off dead or of hurting yourself in some way</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
</tr>
</tbody>
</table>

10. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

<table>
<thead>
<tr>
<th></th>
<th>Not Difficult At All</th>
<th>Somewhat Difficult</th>
<th>Very Difficult</th>
<th>Extremely Difficult</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>〇</td>
<td>〇</td>
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</tbody>
</table>
APPENDIX G: EMR PHQ-9 SCORING TEMPLATE
### PHQ-9 Scoring

<table>
<thead>
<tr>
<th>PHQ-9 Score</th>
<th>Provisional Diagnosis</th>
<th>Treatment Recommendations</th>
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<tbody>
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<tr>
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<td>Depression, mild</td>
<td>Antidepressant or psychotherapy</td>
</tr>
<tr>
<td>15-19</td>
<td>Major depression, moderately severe</td>
<td>Antidepressant or psychotherapy</td>
</tr>
<tr>
<td>Greater than or equal to 20</td>
<td>Major depression, severe</td>
<td>Antidepressant and psychotherapy (especially if not improved on monotherapy)</td>
</tr>
</tbody>
</table>
APPENDIX H: EMR PCP NOTIFICATION TEMPLATE
Northwest Office

03/25/2011 10:50 AM

Dear Clifford Martin MD,

Your patient, Mr. Test was screened for depression in cardiology clinic today and was found to have symptoms suggestive of a major depressive disorder. I have advised Mr. Test to follow up with you as soon as possible for further evaluation and treatment for this condition.

Best Regards,
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