

A Pilot Study in the Screening of Depression in post Myocardial Infarction Patients

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Abstract

In the United States, there is an estimated annual incidence of approximately 600,000 new and 320,000 recurring myocardial infarctions (MI). Within this patient population, there is often the evolution of depressive symptoms. Depression after an MI has been associated with unfavorable outcomes, recurrent cardiac events, and increased mortality. The American Heart Association (AHA), has recommended routine depression screenings, utilizing the PHQ-2 and PHQ-9. There is a 20% prevalence of depression within this patient population, that often goes unrecognized (Zuidersma, Ormel, Conradi, & De Jonge, 2012). The purpose of this pilot study was to implement the AHA recommendation and institute the PHQ-2 and the PHQ-9 depression screening in post-MI patients. The population was identified using a provider worksheet that is populated daily. The duration of the study was 8 weeks with a final sample size was 35 patients, with a total of 5 patients (14.3%) having positive depression screenings. Among those five patients with positive depression screenings, four were male and one female with a mean age of 75.6. Three of the participants screened positive for mild depression, one screened positive for moderate depression and one screened positive for moderate-severe depression. Three of the participants experienced a STEMI and two experience a NSTEMI. Further breakdown of demographic data included two male widowed patients, one male married patient, one single female patient and one male divorced patient. This pilot study supports the AHA recommendation for depression screenings in post-MI patients and will lend itself to an automatic electronic mental health referral for patients screening positive on the PHQ depression screening.

Keywords: myocardial infarction, depression, PHQ-2, PHQ-9, depression screening

Introduction and Background

Cardiovascular disease has become a paramount issue within healthcare. It is an illness that is far reaching and all-inclusive. Once diagnosed, one's lifestyle will require permanent changes. According to the Centers for Disease Control and Prevention (CDC), approximately 610,000 people die of heart disease in the United States every year; one in every four deaths. Heart disease is the leading cause of death for both men and women in the United States. Every year 735,000 Americans experience a myocardial infarction and of these 735,000, 210,000 are experiencing their second heart attack (Centers for Disease Control and Prevention [CDC], 2015). Of these patients who experience their second myocardial infarction, between 21% and 33% are re-hospitalized within one year (Reese, Freedland, Steinmeyer, Rich, Rackley, & Carney, 2011, p. 626). The estimated cost of re-hospitalization for acute coronary syndrome is \$13,000 to \$30,000. Re-hospitalization accounts for a majority of the annual cardiovascular related expenditures in the first year after the initial admission for acute coronary syndrome (Reese et al., 2011, p. 626). The numbers are concerning. It is critical to identify factors associated with risk for re-admission.

A diagnosis of myocardial infarction carries numerous life-changing alterations. The individual must now take medications, alter eating habits, start exercising, just to name a few life-style changes. These new lifestyle changes carry a psychological aspect, and often a degree of depression. Depression is pervasive within cardiovascular disease, with a "prevalence rate of 17% to 47%" and a "prevalence rate of 17% to 27% in hospitalized patients with CAD, and most studies have also demonstrated a negative cardiac prognostic impact in patients with comorbid depression" (Mavrides & Nemeroff, 2012, p. 328). It is common, persistent, and under-recognized. Within the past 20 years, research has shown that depression is more common in

cardiac patients as compared to the general population. Depression is a significant risk factor for cardiac morbidity and mortality. Depression in myocardial infarction (MI) patients is associated with a 2.0 to 2.6 times higher mortality risk (Meijer, Jan Conradi, Bos, Thombs, van Melle, & de Jonge, 2011, p. 204).

Depression is an independent risk factor in the development of mortality associated with cardiovascular disease in otherwise healthy persons. Depression is highly prevalent in cardiac patients, approximately 31-45% of patients with cardiac disease suffer from clinically significant depressive symptoms. In addition, 15-20% of patients with cardiovascular disease meet the criteria for full syndrome Major Depressive Disorder (MDD); this rate of MDD is roughly threefold higher than in the general population. (Huffman, Celano, Beach, Motiwala, & Januzzi, 2013). Depression within this patient population is often chronic and recurrent. As stated by Huffman, et al, “rather than being a transient reaction to a cardiac event, depression for many patients exists for months or years before and persists long after the event. In studies that examine the course of post-MI depression, depressive symptoms remain at steady levels of severity over the 12 months after the MI (Huffman et al., 2013, p. 2). Depression in patients who have had an MI is an important clinical concern because it is extremely common and because the comorbidity complicates the depression treatment, and in turn, worsens the cardiovascular prognosis. Depression has been associated with increased morbidity and mortality. Yet, despite the many studies that have linked depression and poor outcomes after a cardiac event, depression has not been formally recognized as a poor prognostic indicator (Spring, 2014.) According to the American Heart Association (AHA), “depression is commonly present in patients with coronary heart disease (CHD) and is independently associated with increased cardiovascular morbidity and mortality. Screening tests for depressive symptoms should be applied to identify

patients who may require further assessment and treatment” (Lichtman, Bigger, Blumenthal, Frasure-Smith, Kaufman, & Lesperance, 2008, p. 1768). Depression is associated with decreased compliance to medications, as well as a triple the risk of non-compliance with medical regimens. Depression also reduces the probability of successful modifications of other cardiac risk factors, participation in cardiac rehabilitation, as well as reduced quality of life (Lichtman et al., 2008).

Depressive symptoms post MI have been associated with higher healthcare utilization and healthcare costs, “increased hospital readmissions (particularly cardiac readmissions), and reduced adoption of secondary prevention behaviors, including smoking cessation, physical activity, and cardiac rehabilitation” (Huffman et al., 2013, p. 3). The need to evaluate depression and provide treatment, if necessary, is critical. The lack of implementing this evaluation will have a negative influence on the course of cardiovascular disease, including quality of life, health care utilization, readmission rates, and mortality (Huffman et al., 2013). Conversely, patients with improved depressive symptoms are more likely to be compliant with medications and follow lifestyle modifications, thus reducing the likelihood of recurrent cardiovascular event (Tsu, 2012).

The American Heart Association anticipates that by 2030, greater than 40% of U.S. adults will have some form of cardiovascular disease. Also anticipated, barring any significant changes in cardiovascular treatment and prevention, the costs of cardiovascular care will triple. There is a sizable amount of research showing the negative prognostic impact of depression in patients with an MI, contributing to increased healthcare costs and decreased quality of life. The average daily cost of an AMI hospitalization in the United States is estimated to be \$1688/day. In a study by Reese, et al. (2011), they found that AMI patients without depression, spent 4.1 hospitalized days. Whereas, patients with depression and AMI, spent an average of 13.4

hospitalized days. This renders an average increase in cost of care of \$15,698 for patients with depression (Reese et al., 2011, p. 632). Screening and treatment of depression is a modifiable risk factor that can be easily implemented and yield great results in improving patient quality of life and decreasing healthcare costs, now and in the future.

Problem Statement

The evaluation and treatment of depression in post myocardial infarction patients is paramount; however, is not practiced at [REDACTED], part of [REDACTED]. This recommendation is part of the recommendations set forth by the American College of Cardiology Foundation and American Heart Association (ACCF/AHA). It is a Class IIa recommendation. A Class IIa recommendation states that the weight of the evidence/opinion is in favor of usefulness/efficacy. The question then begs, “Why is this practice not implemented?” This was the driving force that guided this study. This project instituted a pilot study for the implementation of a depression screening in the post-MI patient population. The protocol employed the use of the Patient Health Questionnaire-2 (PHQ-2) initially. The use of the PHQ-2 helped the practitioner ascertain if the patient was at risk for major depressive symptoms and helped to determine if the full Patient Health Questionnaire-9 needed to be administered (PHQ-9). A score of ≥ 1 on the PHQ-2 triggered the administration of the PHQ-9 (See Appendix A for PHQ-2 and PHQ-9 screening tools).

The current practice at [REDACTED] does not include the use of the PHQ-9 for MI patients. However, every patient admitted to [REDACTED] (regardless of diagnosis) is screened with the PHQ-2. It is part of the standard nursing admission assessment.

This nursing admission assessment is completed on every admitted inpatient. The two questions that construct the PHQ-2 are part of the nursing admission assessment and are a hard-stop within the assessment. The admitting registered nurse, as part of her admission assessment, will ask the two questions that constitute the PHQ-2. However, if either question receives a 'yes' answer, there is no further action. There is a requirement to ask the questions, however there is no follow-up or referral in place to interrogate a positive screening. Patients are being screened for depression, possibly being identified as having depressive symptoms, but no further action is being taken. Another component to the current practice that should be addressed is having the automatic mental health referral linked to the admission assessment. In the infancy stages of our pilot study, the procedure was to institute the PHQ-9 depression screening via self-administered questionnaire. However, the ultimate goal is to have the PHQ-9 depression screening automatically linked to a positive PHQ-2 depression screening. The second step in this process would then be to have an automatic, electronic mental health consult generated for a positive PHQ-9 depression screening.

The PICO(T) question associated with this evidence-based pilot study was: In post-MI patients does the implementation the PHQ depression screening, as compared to no implementation, increase the identification of depression in this patient population over an 8-week period?

Needs Assessment

The inception of this project started out as in informal conversation based on a co-investigators' observations in caring for patients who have just had a myocardial infarction. She experienced many tearful, emotional conversations with patients who had a myocardial infarction. Through further research, she realized it was an American Heart Association recommendation to implement a depression screening post myocardial infarction. At [REDACTED], a depression screening in post myocardial infarction patients does not exist. However, they have a thriving cardiovascular service line. The need to implement an evidence based, best practice intervention was considerable and palpable. The implementation of a depression screening will augment and advance an already distinguished cardiovascular practice.

In 2009, the United States Preventive Services Task Force “called for depression screening in primary care where supports are in place to ensure appropriate diagnosis, treatment, and follow-up” (Thombs, et al., 2012, p. 414). Although this refers to primary care, there was no specific recommendation referencing cardiac care. The depression screening is also a recommendation from the American Heart Association, which is non-profit organization within the United States. The AHA supports the use the PHQ depression screening in post-MI patients. However, it is a recommendation only. There is a lack of governmental policy regarding depression screening in post-MI patients has funneled down to a state and local domain. There is no locally available data connected to depression screenings in post- MI patients. The research team originated the implementation of the depression screening in post-MI patients at [REDACTED]. There is no comparative local data. This lack of practice and

lack of data was a compelling circumstance in our decision to implement the depression screening in this patient population.

Objectives and Aims

The aim of this research study was:

- To develop a system of identification and referral for a mental health consult in post MI patients at risk for depression, using the PHQ-2 and, if justified, PHQ-9 depression questionnaire, in an effort to improve post myocardial infarction care.

The objectives of this research study were:

- to implement an American Heart Association Class IIa recommendation in the care of post MI patients, obtaining a sample size of 35,
- to generate an electronic mental health consult based on the score obtained from the PHQ-9 depression screening.

Review of Literature

Depression is a common disorder. It affects over 120 million people worldwide. Recent “epidemiological surveys conducted in general populations have found that the lifetime prevalence of depression is in the range of 10% to 15% (Lepine & Briley, 2011, p. 3). It is a leading cause of disability. The burden of depression can extend beyond the disorder itself and affect mortality risk (See Appendix B). The risk of cardiac mortality after a myocardial

infarction is greater in patient with depression; this risk also being related to the severity of the depressive episode (Lepine & Briley, 2011). Greater manifestations of depression were found to be associated with a significantly higher risk of all-cause mortality and a higher risk of cardiovascular death (Lepine & Briley, 2011). There is also evidence that individuals with depression are more likely to be re-hospitalized within the first year after an MI (Reese, et al., 2011). In the United States, 6.9% of the population (16 million) have reported at least one major depressive episode in the last year (2012). The cost of depression cannot be denied, approximately \$80 billion is lost annually due to lost productivity and the associated health care costs.

In 2008, the American Heart Association (AHA) published an advisory advocating the use of depression screening in cardiac patients, citing a higher prevalence of depression in this patient population. The AHA relied heavily on a 2007 research study by Leonard E. Egede. This study pioneered a path for further studies and ultimately to a new recommendation by the AHA. The objective of the Egede study “was to determine the prevalence and odds of major depression and the incremental effect of major depression on utilization, lost productivity and functional disability in individuals with chronic medical disorders” (Egede, 2007, p. 409). The somewhat vintage study offers practitioners a contemporary approach to new practices in outcomes-focused patient care practices. With the Egede study, over 30,000 adults from the 1999 National Health Interview Survey (NHIS) were investigated. The 12-month prevalence and age/sex adjusted odds of major depression were calculated for numerous chronic illnesses, including coronary artery disease ($n = 3491$). The results were as follows: 9.3% (OR = 2.30, 95% CI) (Egede, 2007, p. 409); in comparison prevalence to 4.8% of those without chronic disease. Egede also found an affiliation between the presence of depression with higher

healthcare utilization and loss of functional status, as well as medication non-adherence. This study identified a connection between cardiovascular disease and depression.

There were numerous studies that have supported and elaborated on Egede's 2007 study. In 2009, a study by Martens, Hoen, Mittelhaeuser, de Jonge, and Denollet investigated 473 patients hospitalized for acute MI (due to lack of electrocardiogram, $n = 419$). Patients were recruited between 2003 and 2006. The myocardial infarction was diagnosed by way of elevated troponin levels with ischemic symptoms (lasting more than ten minutes) or electrocardiogram (ECG) evidence of ST segment elevation or new pathological Q waves. These patients completed the Beck Depression Inventory (BDI) within the first week of hospitalization. The results "relating depressive symptoms with time-related cardiac death or recurrent MI resulted in significant associations for somatic/affective ($p = 0.010$) but not cognitive/affective ($p = 0.153$)" (Martens, et al., 2009, p. 807). Somatic/affective depressive symptoms are associated with an adverse cardiac prognosis. This study is also consistent with another study by de Jonge, strengthening the position that depressive symptoms following an MI are related to cardiovascular prognosis (Martens et al., 2009).

In 2011, a study by Smolderen et al., similar to our own pilot study, was done. This study is known as the TRIUMPH (Translational Research Investigating Underlying disparities in acute Myocardial infarction Patients' Health status) study. The Mid America Heart and Vascular Institute (MAHVI) implemented the two- step depression screening, consisting of the PHQ-2 and PHQ-9, in post MI patients ($n = 503$). These results were compared with concurrent depression screenings at 23 U.S. hospitals that do not have a screening protocol in place ($n = 3533$) (Smolderen et al., 2011). Among those screened at MAHVI ($n = 368$, 135 did not get screened), 90.9% depressed patient were identified ($\text{PHQ-9} \geq 10$). However, the results were significantly

lower when using the PHQ-2 only, 35.6%. Overall, MAHVI had a slightly higher depression recognition rate (38.3%) as compared to the 23 U.S. hospitals that had no depression screening in place (31.5%) (Smolderen et al., 2011). Another approach to depression recognition may be to solely use the PHQ-9, as supported by this study. Although the difference is considered *statistically* insignificant ($p = 0.31$), the value of recognizing depression and providing treatment will change the course of one's life.

Another notable study done in 2011 is known as the Heart and Soul study. The Heart and Soul study is a prospective cohort study, designed to examine the association between depression and cardiovascular outcomes in patients' coronary heart disease (CHD). Although CHD, by definition, is different from acute myocardial infarction; the results can be generalized and supportive to our own pilot study. The Heart and Soul study administered the PHQ-2 to 1024 patients with stable coronary heart disease, and calculated the sensitivity and specificity against a gold standard interview, known as the C-DIS (Computerized Diagnostic Interview Schedule) for major depressive disorder. The AHA recommended screening method had a high specificity (0.91; 95% CI- 0.89 to 0.93), but low sensitivity (0.52, 95% CI- 0.46 to 0.59) for a diagnosis of major depressive disorder. Despite the low sensitivity, the two- step screening process was highly specific and had a high negative predictive value (87%). Also, the patients who screened positive had a 41% greater long-term risk of cardiovascular events, such as myocardial infarction, than those who did not screen positive (regardless of the interview based diagnosis of major depressive disorder) (Elderon, Smolderen, Na, & Whooley, 2011).

A study consisting of a systematic literature search also yielded supporting results. In 2011, Meijer, et al, performed a meta-analysis of over 25 years of research into the relationship between post-MI depression and cardiac prognosis. The researchers performed a systematic

literature search. The studies from Medline, Embase, and PsycINFO investigated the impact of post-MI depression on cardiovascular outcomes. Outcomes were defined as all-cause mortality, cardiac mortality and cardiac events within 24 months post MI. Depression being assessed within 3 months of MI. The systematic review identified 29 studies. There was follow-up described for 16,889 MI patients. Post-MI depression was associated with an increased risk of all-cause mortality (OR 2.25, 95% CI, 1.73-2.93, $p < .001$); cardiac mortality (OR 2.71, 95% CI, 1.68-4.36, $p < .001$); and cardiac events (OR 1.59, 95% CI, 1.37-1.85, $p < .001$). A diagnosis of depression post-MI is associated with a 1.6 to 2.7 increased risk of impaired outcomes within 24 months (Meijer et al., 2011).

In 2012, a study done by Zuidersma, Ormel, Conradi, and de Jonge included depressed and non-depressed patients who were enrolled in two studies: The Depressed after Myocardial Infarction study (DepreMI) and the Myocardial Infarction and Depression Intervention Trial (MIND-IT). The DepreMI study is a prognostic study that evaluates the effects of depression on cardiovascular prognosis in MI patients. The MIND-IT study is a randomized, controlled trial that evaluates the effects of antidepressant treatment in depressed MI patients. The researchers interviewed 442 depressed patients and 325 non-depressed patients using the Composite International Diagnostic Interview to assess post-MI depression. The interview also evaluated the presence of the ICD-10 depressive symptoms just before and after the MI. The results of the study supported the identification and treatment of depression in order to improve patient outcomes. The study saw that with each additional increase of one symptom there was a 15% increased risk of new cardiac events, and this correlation was stronger for the non-depressed sample. The increase in depressive symptoms after an MI (regardless of the state of depression

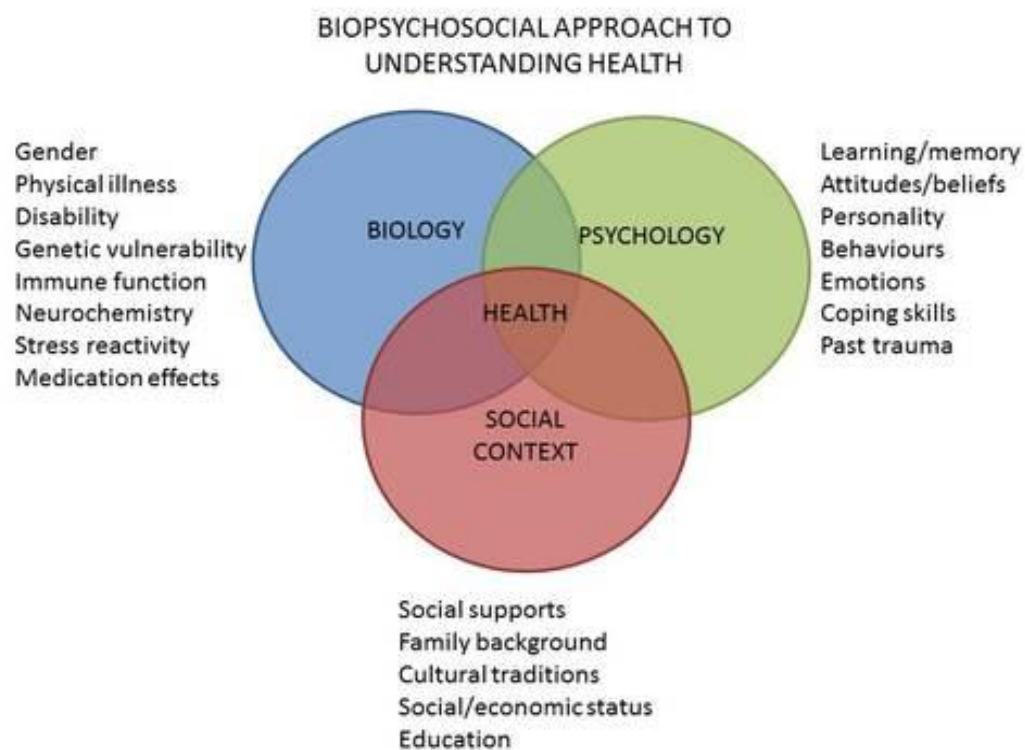
pre-MI) gives explanation and foundation to post-MI depression and its association with poor cardiovascular prognosis (Zuidersma, Ormel, Conradi, & De Jonge, 2012).

In summary, the review of literature supports the implementation of a depression screening post MI. There is a notable relationship between identifying and treating depression in post MI patients and improved outcomes and compliance. As previously stated, 15-20% of patients with cardiovascular disease meet the criteria for full syndrome Major Depressive Disorder (MDD) (Huffman, Celano, Beach, Motiwala, & Januzzi, 2013). This pilot study yielded a result of 14.3%. The results are consistent with the literature review and will lend support to having an automatic, electronic mental health consult ordered based on the PHQ depression screening.

Theoretical Model

Management of the myocardial infarction patients extends beyond the physiologic to include psychological factors that may adversely affect cardiac health; factors such as depression, hostility, social isolation, anxiety, anger, and stress. These factors have been linked to increased mortality and morbidity in cardiovascular patients (Buselli & Stuart, 1999). Traditionally, the management of an acute myocardial infarction focused on physiological factors and the accustomed scientific treatment. However, it is important to consider and incorporate treatment options that embrace the psychological and social components of recovery as well. The nursing theoretical model that will guide this project is taken from George L. Engel and is known as the Biopsychosocial model (BPS). It is an approach that stipulates that biological, psychological, and social factors all play an integral role in human functioning in the context of disease/illness. It assumes that health is best understood in terms of a *combination* of biological, psychological, and social factors. Interestingly, in 1977, when George L. Engel

posited the “need for a new medical model” at the University of Rochester; the example he used to support his new model included the hypothetical discussion of a 55- year old patient who suffered a heart attack. A narrow, biomedical model would look at the situation and simply see tissue necrosis. The remedy would be the traditional and acceptable medications and restoration of blood flow to the affected area. The biomedical model assumes disease to be fully accounted for by deviation from the norm of measurable biological variables (Engel, 1977). The biomedical model presumes that disease be dealt with as an entity independent of social behavior, and be explained on the basis of disordered biochemical and neurophysiological processes. The narrow model leaves little room to consider the social, psychological, and behavioral dimensions of illness. However, these social, psychological and behavioral dimensions of illness all play a fundamental role in managing chronic illness and adhering to lifestyle changes. In order to provide a basis for understanding the determinants of disease, treatments, patterns of health care; a medical model must also take into account the patient, his social and environmental context, and complementary support systems that will affect disease management and adherence to new lifestyle changes (Engel, 1977). The inclusive BPS model takes into account all factors affecting the patient and their interpretation of illness.



As stated by Buselli and Stuart (1999), the mind-body connection provides a framework for exploring a psycho-physiological rationale for the relationship between psychosocial symptoms and physiologic outcomes, specifically, morbidity and mortality, as well as the therapeutic properties inherent in many nonspecific interventions. This framework has implications for cardiovascular nurses who care for patients in the acute phase of a cardiac event as well as across the continuum of cardiovascular health and disease.

In the biopsychosocial model, the mind and body are viewed as inextricably interconnected and this connection is *bidirectional*. Factors that affect psychologic, cognitive, emotional, social, spiritual, and behavioral well-being affect physiologic well-being. For example, in response to stress or anxiety, heart rate and blood pressure rise and angina may result. Similarly, physiologic stress can affect emotional well-being. Simply put, thoughts,

feelings, attitudes, beliefs, behaviors, and biology are interconnected in ways that can contribute to illness or potentiate health and healing.

This framework provides the foundation for a translational study. As defined by the National Institute of Health (NIH) (2010), translational research includes two areas of translation. One is the process of applying discoveries generated during research in the laboratory, and in preclinical studies, to the development of trials and studies in humans. The second area of translation concerns research aimed at enhancing the adoption of best practices in the community (Rubio, Schoenbaum, Lee, Schteingart, Marantz, Anderson, Platt, Baez, & Esposito, 2010). In essence, translational research offers researchers a one-way continuum in which findings are lifted from research into practice.

Project and Study Design

Our project involved initiating a pilot study that included a depression screening for diagnosed myocardial infarction patients. This was a new practice for [REDACTED]. Although, a class IIa recommendation from the AHA, this has never been practiced at this facility. This project also lends itself to future research ventures and will eventually lead to a change in current policy and protocol to include generating an automatic mental health consultation for myocardial infarction patients that have a positive depression screening (See Appendix C for policy draft). For the purposes of this research study, our patient population included select myocardial infarction patients. The inclusion criteria consisted of positive troponin levels indicative of a myocardial infarction, documented diagnosis of an MI, 18

years old or older, male or female, English speaking, able to consent, no cognitive deficits, with a willingness to consent and participate, a cardiologist as the patient's attending physician. The exclusion criteria was non-English speaking patients that require a translator, under 18 years of age, unable to consent, positive troponin levels not indicative of an MI, pregnant women, prisoners, and cognitively impaired patients, as well as patients who do not have a cardiologist as their attending physician. The patients had the PHQ-2 administered by trained research personnel.

Screening tests are widely used to assess the *likelihood* of having a particular disease; they are not diagnostic. They offer an opportunity for early detection and intervention. The PHQ-2 is a brief, two question depression screening instrument with questions answered on a 4-point Likert scale. Based on the score of the PHQ-2, the PHQ-9 may have been implemented. If the patient scores ≥ 1 on the PHQ-2, the PHQ-9 was implemented. A score ≥ 1 on the PHQ-2 is indicative of depressive symptoms and required further investigation. The PHQ-2 has a sensitivity of 91% and specificity of 64% for the diagnosis of major depressive disorder with cardiac patients (Smolderen et al., 2011, p. 285). Specificity is a tests' ability to correctly label a person without a disease, i.e. depression, as negative. Therefore, if a person does not have depression, he or she will test negative on the PHQ. Tests that have a low specificity offer a disadvantage that many patients without the disease will screen positive; thus, increasing the number of false positives and possible treatment interventions (Maxim, Niebo, & Utell, 2014).

The first two questions on the PHQ-2 are also the first two questions on the PHQ-9. These depression screenings took place consecutively. However, the PHQ-9 was a self-administered questionnaire given to the patients to complete independently and their answers were calculated by trained research personnel. The purpose of the PHQ is to detect and measure

depression and severity in the medical populations in clinical settings. The PHQ was “developed from the historical Primary Care Evaluation of Mental Disorders (PRIME-MD), which was shortened to maximize clinical usefulness by combining the 2 original components into a 3-page self-administered version called the PRIME-MD Patient Health Questionnaire (PHQ)” (Smarr & Keefer, 2011, p. 462).

The PHQ-9 and the PHQ-2 are depression modules of the PHQ and currently the most widely used versions in clinical setting (Smarr & Keefer, 2011). The PHQ-9 is a validated tool for depression screening that incorporates the nine necessary criteria as listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM). Both scales are answered on a four item Likert scale. The PHQ-9 is tallied, yielding a possible answer between 0 and 27. A PHQ-9 score of ≥ 10 has a sensitivity and specificity of 88% for major depression (Smolderen et al., 2011). The scoring of the PHQ-9 is also indicative of the degree of depression as follows:

A score of 1-4 = no depression,

5-9 = mild depression,

10-14 = moderate depression,

15-19 = moderately severe depression, and

20-27 = severe depression.

This screening process was recommended in 2008 by the American Heart Association. In 2008, the “American Heart Association recommended a 2-step screening method, consisting of the 2-item Patient Health Questionnaire (PHQ-2) followed by the 9-item Patient Health Questionnaire (PHQ-9), for identifying depression in cardiovascular patients (Elderon, Smolderen, Na, &

Whooley, 2011, p. 533). It is worth mentioning that there are two PHQ-2 questionnaires. There is a PHQ-2 that has a yes/no answer option and a PHQ-2 that offers the 4-item Likert scale answer option (the first two questions of the PHQ-9 are the PHQ-2). This project will be utilizing the 4-item Likert answer option maintaining consistency with the PHQ-9. Appendix A has both instruments. The PHQ-9 can be a self-administered diagnostic tool. It is a dependable and credible measure of depression severity. These considerations, along with the tools' brevity make it a useful and convenient instrument (Wu, 2014).

Setting and Resources

The setting was at [REDACTED] part of [REDACTED]. [REDACTED] is a 500+ bed acute care center located in [REDACTED], part of Monmouth County. It is a Level II Trauma Center. The [REDACTED] consists of sixteen hospitals, as well as 200+ healthcare entities. The services offered from [REDACTED] span the entire length of the Jersey shore, from Atlantic County to Bergen County. [REDACTED] boasts numerous cardiovascular accreditations. They have an accredited Cardiac/Pulmonary rehabilitation program, accredited by the American Association of Cardiovascular and Pulmonary Rehabilitation (AAVCPR). They are a Chest Pain- Cycle 4 and Heart Failure- Cycle 2 accredited hospital, both certifications are awarded by the Society of Cardiovascular Patient Care. They are also Echocardiography accredited, offered by the Intersocietal Accreditation Commission (IAC). [REDACTED] also is a former participant in the American Heart Association Mission: Lifeline. Among all the cardiovascular certifications and accreditations that [REDACTED] and [REDACTED]

System possess, our post-MI care is still lacking. They do not screen or evaluate for depression post-MI. A relatively simple intervention that can yield impressive results. The lack of this practice presents the opportunity for improvement to an already thriving cardiovascular care system.

Study Population

Our study population was taken from patients who had a myocardial infarction by way of elevated troponins and a documented diagnosis of myocardial infarction. The study population was housed on any telemetry monitored unit at [REDACTED], which could be between 10-12 units. On a daily basis, a provider list of acute myocardial infarction (AMI) patients is populated. However, this list also contains other diagnoses (which may be similar to a diagnosis of MI) or patients that may possibly have positive troponins, but not actually be a true MI. This provider list was utilized for our study population. The study sample size was 35 patients. Informed consent was obtained in the patient's room by either the principle investigator or either of the co-investigators. The research team is Collaborative Institutional Training Initiative (CITI) certified. After informed consent was obtained, research personnel administered the PHQ-2 and depending upon the results then provided the patient with the PHQ-9 questionnaire. The patient self-administered the PHQ-9 questionnaire, and based on the results, a mental health consult was ordered. A score ≥ 5 necessitated a mental health consultation. However, due to the brevity of our patients stay, there was the possibility that the patient may not get seen by our mental health professional prior to discharge. In these cases, the initial plan was to give follow-up information to the patient upon discharge home and a follow up phone call would have been provided 7-10 days after discharge

by our mental health professional. However, all patients that had a depression screening were able to be seen prior to discharge.

Risks or Harms

The potential participants were informed there is minimal risk associated with this pilot study. The probability and magnitude of harm or discomfort are no greater than those encountered in daily life or during the performance of routine physical or psychological exams. The researchers anticipate no physical harm or physical injury to the participants. However, the questionnaire deals with sensitive information pertaining to depression. It is not uncommon for patients to get emotional while answering these questions. Patients may feel emotional distress which may be evidenced by anger, crying, they may lie about their feelings, or may feel uncomfortable responding honestly to the questions.

Sources of Data

Data sources came from the PHQ-9 self-administered questionnaires. These questionnaires yielded the number of mental health consults for further evaluation of depression. Depression that would have gone unrecognized had it not been for this research study.

Data Maintenance and Security

This pilot study posed minimal risks to participants. The pilot study took place at [REDACTED], part of [REDACTED]. [REDACTED] already uses a protected software network known as VM Ware. The network is protected via individual sign-on. This is either password protected or a

system known as ‘tap and go’, which requires an employer to use their identification badge to gain access to the system. Either of these protected approaches can be used to gain access to email.

The process of obtaining informed consent took place in person, in the patients’ room. All attempts at maintaining privacy were utilized. The signatures were obtained by CITI certified research personnel. The hard copies of the informed consents were kept in a locked drawer in a locked office belonging to the researchers. The information obtained was also put into an Excel spreadsheet. The spreadsheet is password protected. The primary investigator having sole access.

All participants were assured the information was only for research purposes. They were informed of the confidentiality of their information. They were also informed the computerized data and questionnaires will only be kept for six years and then will be destroyed. All computer data will continue to be passcode protected until erased. All hard copies were kept in a locked drawer in a locked office with only the principle investigator and three co-investigators having access and knowledge of research data location. Upon completion of the pilot study, as per [REDACTED] IRB policy, all informed consent forms will be kept with the principle investigator and destroyed in six years.

Data Analysis

The PHQ-2 and PHQ-9 are classified as Likert scales. Likert scales are psychometric scales commonly used in questionnaires. When participants in a research study respond to a Likert questionnaire, they are specifying a level of agreement or disagreement with a statement. With the PHQ-2 and PHQ-9, the data is analyzed at the interval level of measurement. There is a

composite score (a sum) from four or more Likert type answers. The PHQ-9 can have a score ranging from 0-27. Descriptive statistics recommend using the mean for central tendency and the standard deviation for variability

Quality

There are many characteristics associated with quality research. Quality research often refers to the scientific process enveloping all aspects of the study design. It corresponds with the judgment regarding the affiliation between the methods and questions, selection of the subjects, measurement of the outcomes, and protection against bias. Bias in a research study can occur during all phases of the design; the planning, data selection, data analysis, as well as the publication phase of the research study. Understanding “research bias allows readers to critically and independently review the scientific literature and avoid treatments which are suboptimal or potentially harmful” (Pannucci & Wilkins, 2010, p. 619). According to Pannucci & Wilkins (2010), bias is defined as any tendency which prevents unprejudiced consideration of a question. Bias can occur when error is introduced into sampling or testing by selecting or encouraging one outcome over another. Bias must be considered not only to be present, but to what degree its presence affects the study. Although, some degree of bias is always present; bias can be alleviated.

This study implemented the following strategies in order to reduce bias. There were standardized procedures for data collection and standardized training of study personnel. There was also different examiner(s) reviewing the results as compared to those who administered the questionnaire. Although the PHQ-9 was a self-administered questionnaire, the study personal explained to the study population the purpose of the questionnaire and its indications. Another common form of bias that can occur within a research study is selection bias. This occurs during

the identification and selection of the study population. Our study population was determined by lab values, specifically a troponin level, and a documented diagnosis of an MI. Our study population was clearly defined, using diagnostic criteria, thus decreasing any chance of selection bias.

Ethics and Human Subjects Protection

As researchers, we have a responsibility to our profession, our study, and our clients. We must adhere to the highest of ethical standards in order to assure the function of the study and information cultivated are unblemished. This study was approved by Rutgers-The State University of New Jersey-School of Nursing Institutional Review Board (IRB) as well as the IRB at [REDACTED] for the protection of the participants. Research personnel had current Collaborative Institutional Training Initiative (CITI) certification. Participants were given detailed information about the pilot study. All participants' cooperation was voluntary, with signed informed consent, and they had the right to refuse participation at any time during the research study. All participants were informed of their rights.

Timeline or Timeframe.

The timeframe of the policy implementation was approximately 8 weeks, in order to obtain our sample size of 35 patients.

Budget

The project required minimal resources. The implementation of our policy required no financial funding. The PHQ-2 is a two question four -point Likert scale questionnaire, which required minimal administration time. If either question received a ‘yes’ answer, the PHQ-9 was then completed via self-administration. The PHQ-2 is the first two questions of the PHQ-9. Furthermore, based on the answers to the PHQ-9, a mental health consult was then ordered. If the patient scored ≥ 5 on the PHQ-9, a mental health consult was ordered.

Results

The final sample size was 35. There were five participants who screened positive for depression, which is 14.3% of the total sample population. The depression screenings can further be broken down as follows: three mild depression, one moderate depression, and one moderate-severe depression.

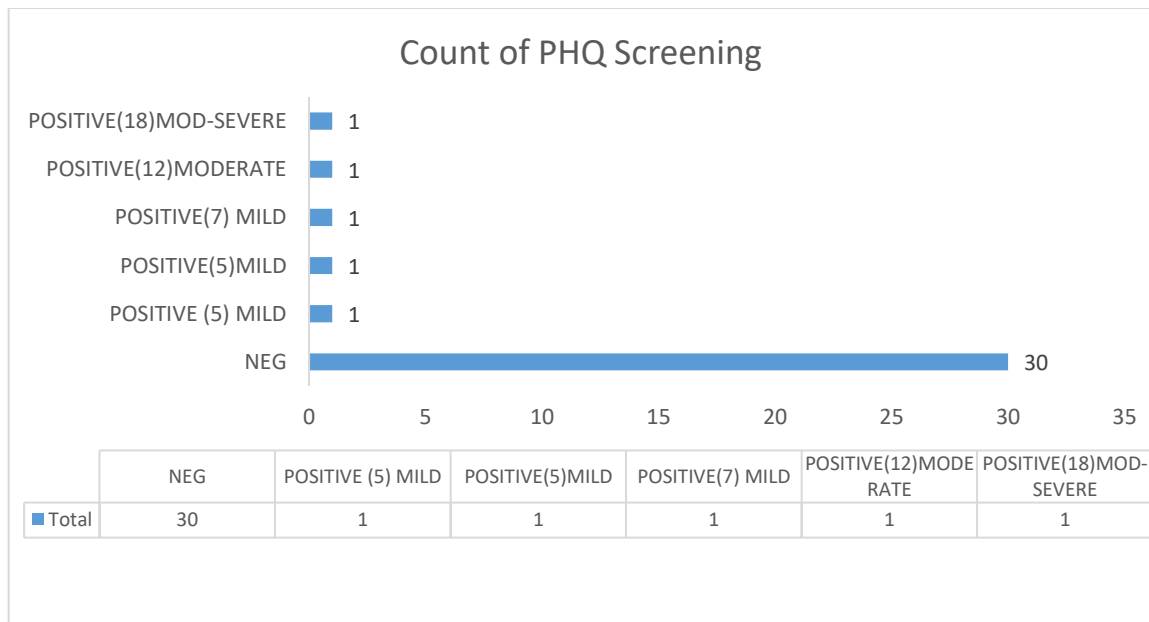


Figure 1. PHQ screening results

Gender analysis reveals overall totals of 17.1% female and 82.9% male among our total sample size of 35, 6 and 29 respectively. The prevalence of positive depression screenings identified among our male population is 11.4% ($n = 4$) and our female population is 2.9% ($n = 1$).

Within the five positive depression screenings, 80% were male ($n = 4$) and 20% were female ($n = 1$).

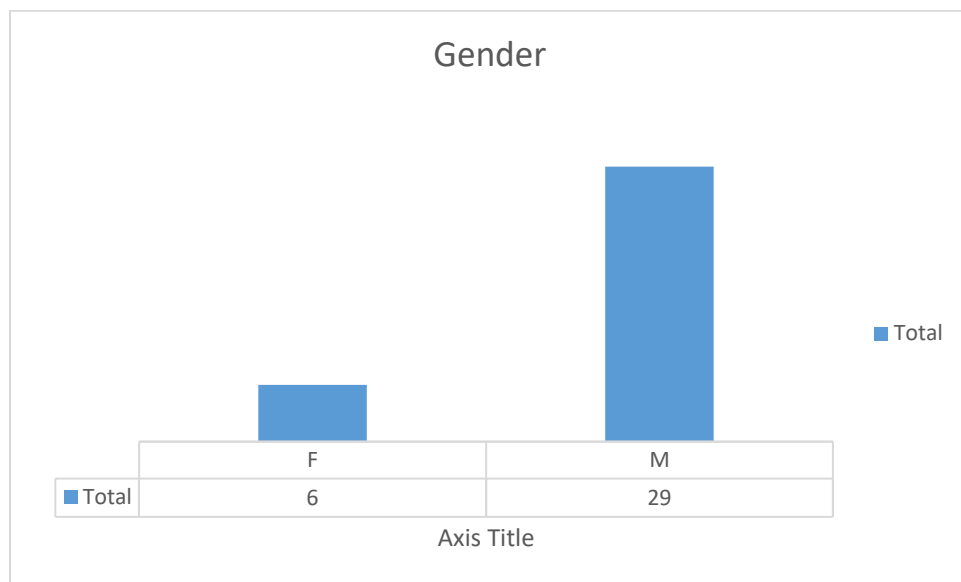


Figure 2. Gender breakdown

There are two main types of MI's, STEMI (ST-segment Elevated MI) and NSTEMI (Non- ST-segment Elevated MI), usually defined by an electrocardiogram (ECG) tracing. The ST-segment of the ECG tracing represents the interval between ventricular depolarization and repolarization; simply put, there is a change in the electrical charge of the cardiac cells. A STEMI is a type of MI that is caused by a complete blockage in a coronary artery; whereas, a

non-STEMI is a partially blocked artery. Both resulting in decreased oxygen to cardiac muscle causing ischemia (cellular damage or death). Both are equally alarming and critical, however, cardiac intervention with a STEMI will be immediate.

Myocardial infarction type can be broken down into 51.4% ST- segment Elevated Myocardial Infarction (STEMI) and 48.6% Non-ST-segment Elevated Myocardial Infarction (NSTEMI), 18 and 17 respectively. The prevalence of depression as identified from the PHQ-9 questionnaire is 16.7% STEMI (n = 3) and 11.8% NSTEMI (n = 2). Within the five positive depression screenings, three were STEMI and two were NSTEMI. Both NSTEMI patients were Caucasian males, one divorced and one married. There was slight variation among the three STEMI patients: two were males and one female. One male patient was Caucasian and widowed. One male patient was African -American and widowed. The female patient was Caucasian and single.

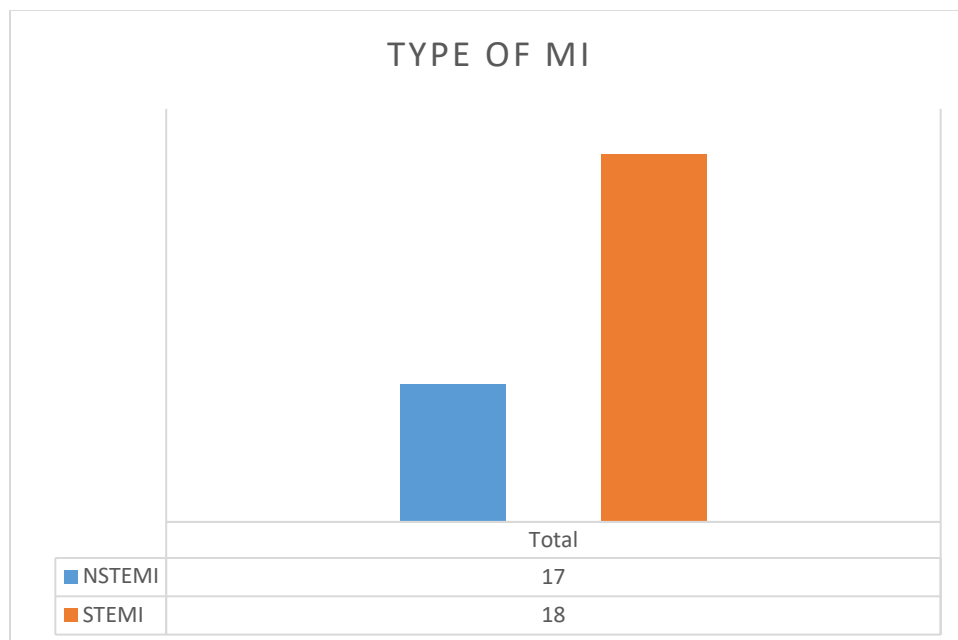


Figure 3. Myocardial infarction type

An ethnicity breakdown of the sample population reveals a primarily Caucasian population, 85.7%, ($n = 30$). Focusing primarily on the five positive depression screenings, the breakdown is as follows: four Caucasian participants and one African-American participant, representative of the entire sample size.

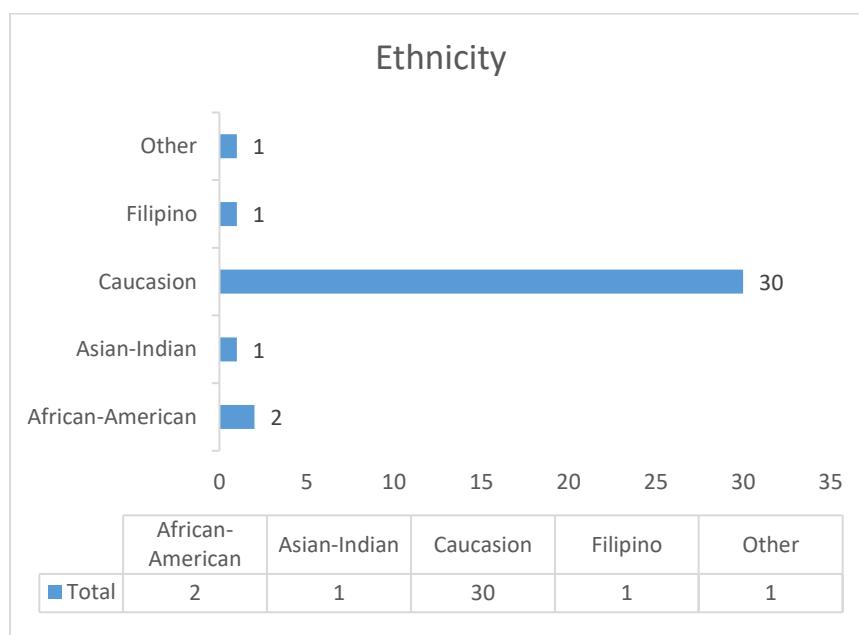


Figure 4. Ethnicity breakdown

The majority of the sample population was married (20 out of 30). A further breakdown of the martial status of those who had positive depression screenings is as follows: two male widowed patients, one male married patient, one female single patient, and one male divorced patient.

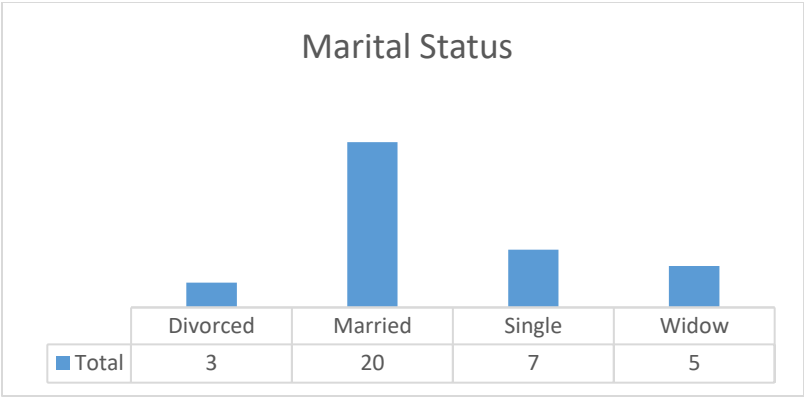


Figure 5. Martial status

The sample as a whole (n = 35) had an average age of 67.9 (SD = 13.29).

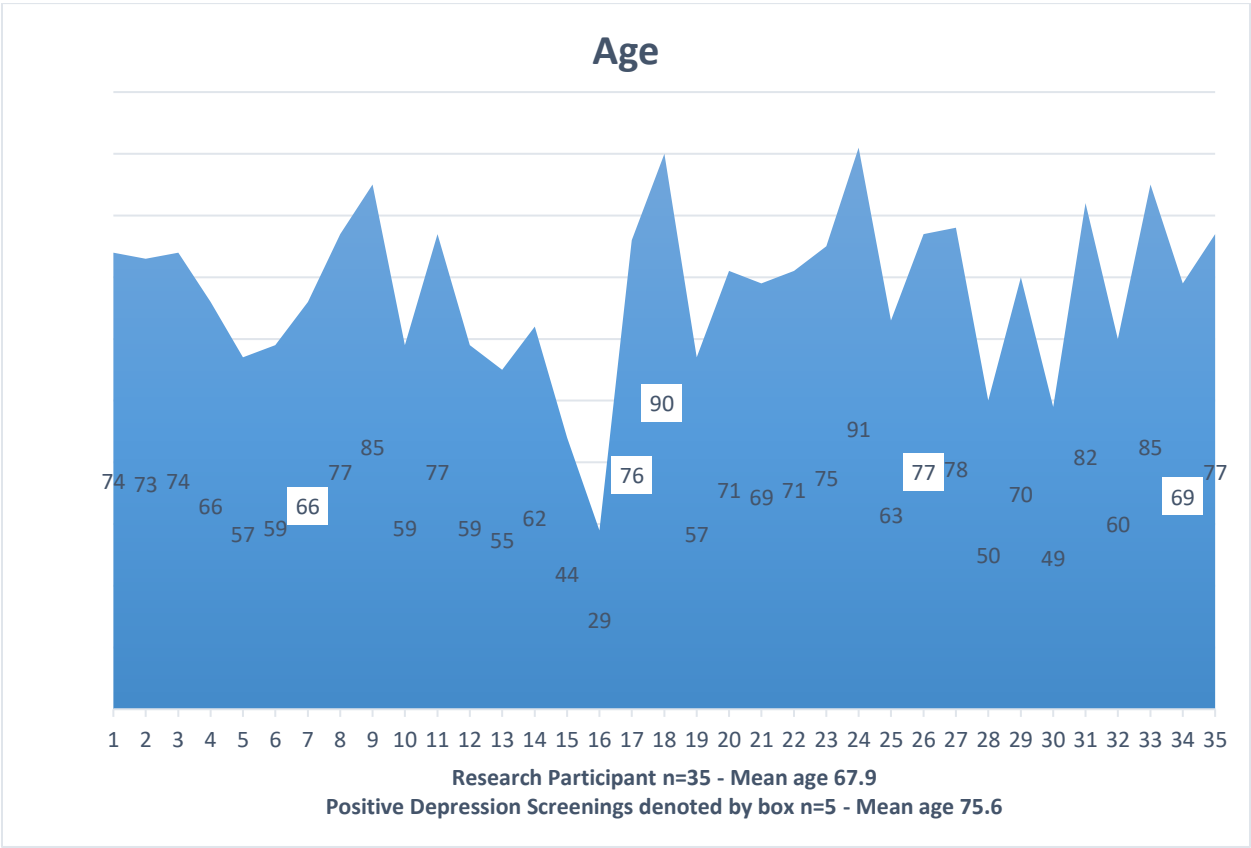


Figure 6. Age distribution

Discussion

The majority of the participants were men, ($n = 29$) or 82.9%; as well as the majority of those having positive depression screenings were men, 80% ($n = 4$). The mean age of the sample was 67.89. The mean age of the males who had positive depression screenings was 75.25. This is supported by the literature review, “the prevalence of CHD is higher in men within each age stratum until after 75 years of age, which may contribute to the perception that heart disease is a man’s disease”, due to a longer female life expectancy, women constitute a larger proportion of the elderly population in which the prevalence of CVD is greatest (Mosca, Barrett-Connor, Wenger, 2011,p.3).

The most noticeable finding during this study was that many patients who were admitted to the hospital with a diagnosis of a myocardial infarction (MI) were not admitted to a cardiologist attending physician. There were many patients who were admitted to medical attending physicians; however, they would have a cardiologist as a consulting physician. The question then is: Does this affect quality of care? During my experience with this pilot study, I would answer that it does not affect the quality of care the patient receives. Our current healthcare system maintains a specialized approach. There is a multidisciplinary approach to patient care. My experience with this pilot study lends support to this aspect of our healthcare system and approach to patient care. The myocardial infarction was being managed by the cardiologist; whilst the remainder of the patient’s care was being managed by the primary care physician.

During a conversation with a cardiologist, we discussed that due to the brevity of the patients’ stay, they felt that addressing the depression was not a priority, as the patient just had a heart attack. I agreed, it was not a *top* priority; however, it could still be

addressed. In an interesting situation, one of our participants had a prior history of depression. He was not been receiving treatment due to financial constraints as well as lack of transportation to counselling. This gentleman chose to delay his discharge, stay on the unit, and be seen by the mental health professional prior to his discharge. He was given resources and follow up information. The mental health liaison that assisted him stated she would also be following up with a phone call in several days. This patient would never have had this opportunity had it not been for this pilot study. It would have taken mere minutes for the nurse to use the PHQ depression screening, and have a mental health consult generated from that screening. This small intervention allowed the patient to receive a comprehensive approach to his care, not only in the hospital but upon discharge. This comprehensive approach will most likely allow for better compliance and outcomes. Within our pilot study we identified 5 out of 35 patients who had a positive depression screening and received a mental health consultation. Although, this pilot study is not measuring outcomes and compliance, our results were consistent with the research.

This story also lends itself to the importance of social support in treating depression. This patient, although willing to receive treatment, did not have the social support to encourage participation in treatment programs. Familial and personal relationships act as a buffer against the dangers of depression. Depression will often lead to feelings of isolation, hopelessness, thoughts of despair, and possibly suicidal thoughts. Social support systems help to combat the perils of depression. Social support is critical to the treatment of depression (Krull, 2016). Support systems can reverse isolation, improve a person's outlook on life, and even help generate solutions for depression treatment and management. Knowing one is not alone will positively affect your life focus (Krull, 2016).

Recommendations

It was in the very early stages in this pilot study that the researchers knew a change would have to be made to our inclusion criteria for future studies. Our inclusion criteria stated that any participant would have to have a cardiologist as an attending physician. This critically limited our patient choice. The first and most prominent recommendation would be to not limit your patient pool based on attending physician, any patient who is diagnosed with an MI should be eligible to participate in the study.

Recommendation #2: As previously mentioned, any patient who is admitted to [REDACTED] [REDACTED] is required to have a Nursing Admission Assessment. The PHQ-2 is a mandatory part of this assessment; however, there is no electronic trigger for follow-up if the patient answers 'yes' to either question. This is a huge gap in quality of care. My recommendation is to have the PHQ-9 electronically generated with a positive PHQ-2 screening. If the PHQ-9 has a score of ≥ 5 a mental health consult will automatically be electronically generated. This would include all inpatients, including MI patients. It is the easiest and most efficient way in which to screen for depression within our current electronic system, and have follow up from a mental health professional. The electronic capability is already present, but is not being utilized. There would be little to no cost involved in activating this electronic capability. As principle investigator, I will be working in conjunction with the [REDACTED] Information Technology department in this mutual undertaking.

Recommendation #3: My third recommendation would be to implement the depression screening in the outpatient setting. During the course of this study there were many patients

who, when informed about the study, would be surprised I was inquiring about depression. This study took place between 24-72 hours post- MI. During this time, there is a flood of emotions experienced. The possibility of depression may or may not have surfaced; rather than being a transient reaction to a cardiac event, depression for many patients exists for months or years before and persists long after the event. In studies that examine the course of post-MI depression, depressive symptoms remain at steady levels of severity over the 12 months after the MI (Huffman et al., 2013, p. 2).

The implementation of the PHQ-2 depression screening tool is not only an American Heart Association recommendation, but can vastly improve patient quality of care and will lend itself to improved compliance and patient outcomes.

These recommendations will be communicated to [REDACTED] [REDACTED] and disseminated at the following committees: The Acute Coronary Syndrome committee, the Department of Cardiology Section committee, Medical Staff Committee, Cardiology Steering Committee, as well as Nursing Congress. This project will also be disseminated among the [REDACTED] newsletter in the January, 2019 edition.

Strengths and Weaknesses

There were numerous weaknesses associated with research studies. One particular weakness was lack of comprehensiveness with our sample population. Our sample population consisted of patients that are AMI patients and have ruled in for a myocardial infarction. One of our defining criteria was a positive troponin. However, there are patients that have positive

troponins that are not considered positive myocardial infarctions. These patients are considered Type 2 MI's. The elevated troponin level can be attributed to other physiological nuances. There are numerous reasons as to why a patient may have positive troponins and not be considered a positive myocardial infarction. Therefore, some may say a weakness of the study could possibly be over-screening of cardiac patients. However, due to the prevalence of depression globally, over-screening should not be considered a weakness. The PHQ depression screening tool is a brief tool that can easily be administered, adding no extra burden to the healthcare practitioner. Another weakness of the study that can contribute to the lack of comprehensiveness was part of our inclusion criteria. As part of the inclusion criteria, the researchers stated that the attending physician needed to be a cardiologist. However, this criteria excluded many possible participants. There were many patients who had a primary care physician as their attending. This reduced our sample pool significantly.

The long-term goal of this study will be to have an automatic, electronic mental health consult completed on all AMI patients who screen positive on the PHQ-9, regardless of attending physician. This study had numerous strengths. The study will be generalizable to an entire population of cardiac patients. The implementation of a depression screening can actually be utilized within numerous disciplines of healthcare, including both acute and chronic illnesses. There is also a future plan to have a depression screening utilized with our stroke population. This pilot study will be the foundation and infrastructure on which other studies and protocols can be built. In addition, the implementation of the questionnaire is brief and the data collection and analysis is relatively succinct.

Translation

This project has the capability of being translated to all patient admitted to [REDACTED], as well as all [REDACTED] hospitals. Currently, there are several electronic documenting systems being utilized within this system. The current plan is to implement one system to all [REDACTED] facilities. This depression screening has the ability to reach all patients admitted to a [REDACTED] facility. It also has the capability to expand beyond cardiology and be utilized in other healthcare disciplines.

Conclusion

In summary, healthcare practitioners aspire to provide the best care to their patients. Ultimately, practitioners want to provide the best evidence-based care possible in order to guarantee safe and effective care. This pilot study will assist in this achievement. The American Heart Association has deemed depression screening in AMI patients a Class IIa recommendation. This simple screening utilizing the PHQ-2 and PHQ-9 has the ability to improve our patient's quality of life, as well as increase compliance with a new lifestyle. It also has the ability to give a diagnosis to "what I've been feeling." Depression often goes unrecognized and therefore, untreated. The ability to tell our patients that their experiences are normal and expected can be the difference between life and death.

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Appendix A

PHQ-2 Yes/No Option

During the past month, have you often been bothered by:

- 1.) Little interest or pleasure in doing things? Yes/ No
- 2.) Feeling down, depressed or hopeless? Yes/ No

If the patient's responded "no" to both questions, the screen is negative.

If the patient responded "yes" to either question, consider asking more detailed questions or using PHQ-9 patient questionnaire.

PHQ 2 and 9/ Likert Scale Option

During the past two weeks, how often have you been bothered by of the following problems?

- 1.) Little interest or pleasure in doing things,
- 2.) Feeling down, depressed, irritable or hopeless,
- 3.) Trouble falling or staying asleep or sleeping too much,
- 4.) Feeling tired or having little energy,
- 5.) Poor appetite or overeating,
- 6.) Feeling bad about yourself --or feeling that you are a failure, or have let yourself or your family down,

7.) Trouble concentrating on things, like reading the newspaper or watching television,

8.) Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you were moving around a lot more than usual,

9.) Thoughts that you would be better off dead, or of hurting yourself in some way,

(0) Not At All

(1) Several Days

(2) More Than Half the Days

(3) Nearly Every Day

(Elderon et al., 2011, p. 535).

Appendix B

Burden of Depression

Classical Burden

- Residual symptoms
- Cognitive impairment
- Relapse and recurrence
- Decreased quality of life

Mortality Burden

- Suicide
- Cardio and cerebrovascular

Disability Burden

- Psychosocial
- Work days lost

Family burden

Economic burden

Appendix C

Post Myocardial Infarction Depression Screening General Nursing Procedures

Document Number:
Document Owner:
Author:

Revision:
Date Last Updated:
Status:

General Description

Purpose: To define the guidelines for assessment and screening of post myocardial infarction depression, and to outline procedures for follow-up care and intervention.

Scope:

Policy: Based on recommendations for the American Heart Association, all positive myocardial infarctions patient will be screened by a registered nurse for depression prior to discharge. The tool utilized will be the PHQ-2, and where applicable, the PHQ-9.

Procedure:

1. Each patient will be informed of the depression screening and their right to refuse.
2. The patient will be asked two questions, which constitute the PHQ-2.
3. If the patient receives a score of ≥ 1 on the PHQ-2, then the PHQ-9 will be instituted.
4. When the score of the PHQ-9 is > 5 , a mental health referral will be made.

Appendix D

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)	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
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	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

(FOR OFFICE CODING) 0 + _____ + _____ + _____
=Total Score: _____

Appendix E

**A Pilot Study in the Screening of Depression in post-Myocardial Infarction patients
Demographic Data Collection Sheet**

Patient Name: _____

DOB: _____

Age: _____

Medical Record #: _____

MI Type: STEMI _____ NSTEMI _____

PHQ Screening: Negative _____

Positive _____ **Score** _____

Consult Completed: _____

Investigator Name: _____

Attending MD: _____

