

MENTAL HEALTH NAVIGATION FOR DEPRESSION IN A COMMUNITY CANCER  
CLINIC: PREDICTORS OF NAVIGATION ENGAGEMENT AND RESPONSE

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## DEDICATION

To my wonderful husband who inspires me, supports me, and makes me smile every day. I could not have done this without you.

Thank you to my committee members for their guidance and encouragement throughout this process. Thanks also to Tori, Daniel, and Aysha for their help and contributions to this project.

MENTAL HEALTH NAVIGATION FOR DEPRESSION IN A COMMUNITY CANCER  
CLINIC: PREDICTORS OF NAVIGATION ENGAGEMENT AND RESPONSE

by

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DISSERTATION

Presented to the Faculty of the Graduate School of Biomedical Sciences

The University of Texas Southwestern Medical Center at Dallas

In Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

The University of Texas Southwestern Medical Center at Dallas

Dallas, Texas

August, 2019

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MENTAL HEALTH NAVIGATION FOR DEPRESSION IN A COMMUNITY CANCER  
CLINIC: PREDICTORS OF NAVIGATION ENGAGEMENT AND RESPONSE

Publication No. \_\_\_\_\_

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The University of Texas Southwestern Medical Center at Dallas, 2019

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Guideline-driven detection and treatment of depression is a priority; however, little evidence exists to show that these promising guidelines are effective. To address this problem, the UT Southwestern Moncrief Cancer Institute implemented universal depression screening plus mental health navigation (i.e., brief mental health assessment and treatment recommendations via phone with ongoing, periodic calls for symptom monitoring and recommendations). This project evaluated a set of *a priori* defined sociodemographic, depression, navigation, and treatment variables using the Least Absolute Selection and

Shrinkage Operator to create predictive models of characteristics hypothesized to be associated with navigation engagement, depression remission, and  $\geq 50\%$  symptom reduction. Retrospective, longitudinal medical record data were compiled. Of 991 adult patients screening positive for depression ( $\text{PHQ-9} \geq 5$ ), 21% completed a navigation call. Patients ( $N=207$ ) were mostly middle-aged ( $50 \pm 10.98$ ), female (88%), racially diverse (39% Hispanic white, 26% black), and English speakers (76%). Most were unemployed (57%), uninsured (48%), and were cancer survivors (60%). Most patients ( $n=125$ ; 60%) completed 2+ navigation calls. Being employed was associated with a lower likelihood of engaging in multiple mental health navigation calls (odds ratio=0.71). Few patients ( $n=24$ ; 19%) reached depression remission ( $\text{PHQ-9} < 5$ ), while many ( $n=51$ ; 41%) achieved  $\geq 50\%$  symptom reduction. Sociodemographic characteristics were influential in predicting remission and symptom reduction (odds ratios=0.65-1.57). As hypothesized, suicidal ideation reduced the odds of remission by 35%. Contrary to hypotheses, the odds of achieving remission or reduction in symptoms were reduced by 11% and 7%, respectively, as navigation calls exceeded 2 calls. Furthermore, clinical characteristics like depression treatment utilization and baseline depression severity were not predictive of engagement in navigation, depression remission, or symptom reduction. Predictors for remission and symptom reduction differed, indicating a need to examine these outcomes separately. These data suggest the need to re-evaluate guidelines for these distinct goals using real-world data and robust statistical techniques.

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## LIST OF ABBREVIATIONS

ASCO – American Society of Clinical Oncology

HBM – Health Belief Model

HIV – Human Immunodeficiency Virus

Lasso - Least Absolute Shrinkage and Selection Operator

MH-SCAN – Mental Health Screening, Assessment, and Navigation

MHN – Mental Health Navigation

NCI – National Cancer Institute

PCP – Primary Care Provider

PHQ – Patient Health Questionnaire

VS<sup>6</sup> – VitalSign<sup>6</sup>

## **CHAPTER ONE**

### **Introduction**

Depression is associated with impairments in health and quality of life, and these associations are more severe in patients with co-morbid health conditions like cancer. Previous estimates indicated that about 25% of patients in an oncology setting suffered from significant depressive symptoms (Massie & Holland, 1990). More recent population-based data allows for more precise estimates and indicates that the proportion of cancer survivors who experience major depressive disorder is closer to 14%, though many more may struggle with sub-threshold depressive symptoms (Zhao et al., 2014).

Many barriers impact the detection and treatment of depression in an outpatient oncology setting. Some barriers are related to organizational issues in healthcare (e.g., medical coding and reimbursement for depression screening) or logistical difficulties, while other barriers are related to provider and patient attitudes. Providers have now been directed by federal and professional organizations to incorporate mental health screening and treatment into oncology practice (Andersen et al., 2014; National Institute for Health and Care Excellence, 2009a). However, research demonstrating how to effectively implement these practices into clinical care is limited (Jacobsen, 2017).

Mental health navigation, a variation on the more general patient navigation, may be an effective method to support implementation of mental health screening and treatment guidelines within oncology settings. Patient navigation was created in 1990 to address health disparities related to detection of and access to treatment for breast cancer among the underserved (Freund et al., 2008) and has been effective in improving the targeted outcomes

(K. J. Wells et al., 2008). Staff at the UT Southwestern Moncrief Cancer Institute (henceforth referred to as Moncrief) created the Mental Health Screening, Assessment, and Navigation program (MH-SCAN) with the purpose of detecting clinically significant depressive symptoms, assessing mental health needs, and navigating patients to evidence-based mental health treatment within Moncrief or in the surrounding community. Previous analysis of this program at Moncrief indicated that patients who were able to be contacted for the program experienced a greater reduction in depressive symptoms than those who were unable to be contacted for mental health navigation (Jester, 2017).

The present study sought to further understand if implementation of the mental health screening and treatment guidelines, as operationalized by the MH-SCAN program, was effective by exploring two aims. The first aim was to identify which patient characteristics are associated with patient engagement in mental health navigation. The second aim was to understand which factors predict if an engaged patient will achieve a clinically significant benefit from mental health navigation. This information will help to identify if mental health navigation for guideline-based depression care is utilized by and effective for patients presenting for care at an outpatient oncology clinic. Findings and recommendations for further study are discussed.



## **CHAPTER TWO**

### **Review of the Literature**

#### **DEPRESSION**

##### **Prevalence and Consequences**

Depression is currently one of the most common mental health concerns worldwide. Depression imposes high direct (e.g., treatment costs) and indirect (e.g., reduced productivity) costs on society (Cassano & Fava, 2002; Cuijpers, Beekman, & Reynolds, 2012). Annual costs associated with depression are estimated to be approximately \$210 billion based on data from 2010 (Greenberg, Fournier, Sisitsky, Pike, & Kessler, 2015). Importantly, these costs are highest among people with comorbid medical conditions, like cancer. Cancer survivors have a higher prevalence of depression (13.7%), compared to 8.9% of adults without a history of cancer (Zhao et al., 2014). Furthermore, among cancer survivors, those with depression spend approximately one-third more on healthcare and are more likely to present to an emergency department than those without depression (Pan & Sambamoorthi, 2015).

In addition to increased healthcare costs, other negative consequences contribute to the toll of depression on patients with cancer, and more broadly, to the impact of depression on society. For example, cancer survivors, particularly those with depression, have an increased rate of suicide compared to the general population (Anguiano, Mayer, Piven, & Rosenstein, 2012; Robson, Scrutton, Wilkinson, & MacLeod, 2010). One review found that compared to the general population, cancer survivors are twice as likely to die by suicide (Misono, Weiss, Fann, Redman, & Yueh, 2008). Suicide is estimated to contribute about 5% to the overall economic cost of depression (Greenberg et al., 2015).

Beyond concerns about suicide, cancer survivors with depression are also at an elevated risk of mortality compared to those without depression (Pinquart & Duberstein, 2010). This relationship is hypothesized to be due to their poorer adherence to medical treatment (Kissane, 2009; Manning & Bettencourt, 2011). Among breast cancer survivors, depression symptoms lowered survivors' perceptions of medication effectiveness and increased perceived impediments to implementing the treatment plan to treat their cancer (Manning & Bettencourt, 2011). Combined, these perceptions lowered adherence to taking medications for cancer treatment (Manning & Bettencourt, 2011). Additionally, for those with more severe depressive symptoms, depression seems to exert a greater negative effect on their intention to adhere to medical treatment (Manning & Bettencourt, 2011). Further evidence for the inverse link between depression and medical adherence comes from research on psychological interventions implemented in cancer settings.

Lastly, depression significantly impacts quality of life and daily functioning. Depression has been associated with a greater negative impact on quality of life than major chronic medical conditions (Brenes, 2007). Further, depression and chronic medical conditions have additive negative effects on functional ability and quality of life (K. B. Wells et al., 1989). For example, functional ability is reduced substantially in those with depression similar to that of angina and coronary artery disease (K. B. Wells et al., 1989). These psychosocial consequences of comorbid depression and cancer are costly for patients, both in terms of financial impact and overall well-being.

Based on findings that depression is a condition that is devastating for patients' well-being and has significant economic costs, depression is a necessary target for intervention.

The high rate of comorbidity of depression with medical conditions presents providers within medical settings ample opportunity to detect and treat depression. When examining depression from a public health perspective, programs to detect and treat depression have significant potential to both improve patients' lives and the cost of depression on society.

### **Difficulties in Diagnosing and Treating Depression in a Medical Setting**

While the high comorbidity of depression and medical diagnoses presents an opportunity for medical providers to increase the rates of treatment of depression, there are many barriers to the detection and accurate diagnosis of depression in a medical setting. One barrier is differential diagnosis. Certain symptoms can be attributable to physical illness, side effects from medical treatment, a mental health diagnosis, or a combination of these causes. For example, changes in appetite, sleep, and energy level are common to cancer, side effects of chemotherapy and radiation, as well as depression (Dauchy, Dolbeault, & Reich, 2013; Saracino, Rosenfeld, & Nelson, 2018). To further complicate the dilemma of the under-treatment of depression, historically, many oncology providers believed that depressive symptoms were "normal" in the context of receiving a cancer diagnosis and thus did not require treatment (McFarland, Lahijani, & Holland, 2016). While many of the somatic or cognitive symptoms of depression, cancer, and cancer treatment overlap, depressed mood and/or lack of pleasure in previously enjoyed activities for two or more weeks is fundamental to depression and not considered "normal" in patients with medical conditions (American Psychiatric Association, 2013).

Beyond the issues in accurately detecting and diagnosing a patient's mood symptoms, there are significant obstacles to addressing depression in medical clinics. Some of these

barriers include organizational pressure to see more patients and to shorten appointment times, staff shortages, provider turn-over, and limitations on billing and reimbursement for evaluation and treatment (Knies et al., 2018; Sanchez, 2017). Managed care programs add the additional burden of requiring a referral for a specialty provider without having a mechanism for compensation for additional labor of referring or collaborating with outside providers (Pincus, Hough, Houtsinger, Rollman, & Frank, 2003). These have all contributed to the lack of implementation of collaborative care interventions (Katon, Unützer, Wells, & Jones, 2010). Systemic changes are likely needed in order to improve the ability and willingness of providers in a healthcare system to detect and treat depression.

### **Patient Factors Impacting Diagnosis and Treatment of Mental Health Conditions**

While there are significant impediments or difficulties to address at the provider and organizational level, it is also true that patients have unique barriers to discussing mental health and engaging in psychological services. One important barrier is the nature of depression itself, which impacts patients' motivation, energy levels, and perception of their worthiness. Andersen (2014) notes that depressed patients may lack motivation to follow-up with treatment recommendations, which provides the rationale for guidelines' insistence on providers having repeated contact with patients to assess treatment adherence.

Logistical barriers to mental health care utilization include time constraints, physical limitations, and lower socioeconomic status (Mosher et al., 2009). Cancer survivors often report lack of knowledge about available supportive or mental health services as a main reason for low utilization of care (Eakin & Strycker, 2001; Kumar et al., 2012; Mosher et al., 2009; Mosher et al., 2014). Another common utilization barrier is lack of physician referral

(Eakin & Strycker, 2001; Kumar et al., 2012). Conversely, facilitators of mental health care utilization among cancer survivors include higher education and higher socioeconomic status (Mosher et al., 2009), having depression or another mental health diagnosis, and more advanced cancer (Cohen et al., 2018).

Another important potential barrier is variability in patient desire to engage in psychological services in an oncology setting. For example, some studies have found low perception of need for mental health services in patients with prostate cancer [22%; (Shapiro et al., 2004)] and in patients with lung cancer [75% denied a need for help and 58% reported they preferred to manage their emotions independently (Mosher et al., 2014)]. Whereas, other studies found higher rates of willingness to engage in psychological services among lung cancer survivors [51.4%; (Sanders, Bantum, Owen, Thornton, & Stanton, 2010)] and survivors of cancer from multiple sites [60% (Mackenzie, Carey, Sanson-Fisher, D'Este, & Yoong, 2015)]. Mackenzie and colleagues (2015) found that those who denied wanting to discuss mental health concerns with their physician cited mental health as being less important than their cancer care, they preferred to discuss mental health with a different person, they thought their doctor would not be able to help them, and they reported discomfort with discussing mental health contributed to their lack of desire (Mackenzie et al., 2015). One consistent finding is that many patients wish for more information about their health and about available treatments even if they do not desire referrals for supportive care treatments (Sanders et al., 2010; Shapiro et al., 2004).

The literature suggests that cancer survivors commonly prefer to seek mental health care from their Primary Care Physician (PCP) (Mackenzie et al., 2015; Mosher et al., 2014).

While primary care has been labeled as the “de facto mental health system” (Kessler & Stafford, 2008, p. 9), PCPs also have many barriers to providing mental health care and have historically struggled with treating depression. One meta-analysis found that general practitioners correctly identified only 47.3% of depression cases (Mitchell, Vaze, & Rao, 2009). Therefore, patients may prefer to obtain treatment from their PCP, but these providers may benefit from additional assistance from colleagues with more expertise in depression and mental health.

While some patients would prefer not to address mental health in oncology settings, it is important to have services available given the potential negative acute and distal impact of distress. For example, in a study of adolescent and young adult cancer survivors, nearly a third of patients reported significant distress and unmet needs for information, counseling, and support, which was associated with sustained distress over time (Zebrack et al., 2014). However, literature on patients’ receptivity to mental health care in cancer is limited, which further complicates providers’ ability to develop effective programs targeted at those who desire psychological services.

Developing effective programs to diagnose and treat depression is also impacted by stigma and emotional factors that often influence patient willingness to discuss mental health and to seek treatment (McFarland et al., 2016; Mosher et al., 2009). Among those who report unmet needs for mental health care, men are more likely to report psychosocial barriers (e.g., stigma and mistrust or fear of the healthcare system) to seeking mental health care (Ojeda & Bergstresser, 2008). Men with cancer have also reported greater emotional barriers (e.g., embarrassment regarding seeking help) to pursuing psychological services (Mosher et al.,

2009). Conversely, people who identify as Latino, identify as African American, who have a high school education or less, and who have an income under \$30,000 were *less* likely to report having any psychosocial barriers to care (Ojeda & Bergstresser, 2008).

Patients with a mental health diagnosis were more likely to report stigma and mistrust of the healthcare system as barriers to mental health care but were least likely to have negative feelings about treatment (Ojeda & Bergstresser, 2008). The authors hypothesized that differences in psychosocial barriers may be related to social status and perceptions of care leading to a loss of status. Among head and neck cancer survivors, patients with a diagnosis of depression, anxiety, or a substance use disorder were more likely to endorse higher levels of stigma and self-stigma which interfered with supportive care utilization (Cohen et al., 2018). Furthermore, stigma and mistrust appear to vary by age. People between the ages of 18 and 25 have greater concerns about stigma and people between the ages of 18 and 34 have less trust of the healthcare system (Ojeda & Bergstresser, 2008). Interventions that utilize a collaborative relationship with the patient as an avenue for providing information to reduce stigma and increase understanding of mental health care may be effective in reducing barriers to treatment.

### **Screening and Treatment Guidelines**

Given the importance of effectively treating depression in medical settings, guidelines have been published for the screening and treatment of depression in primary care and general medical settings [e.g., US Preventive Services Task Force (Siu & the U. S. Preventive Services Task Force, 2016a, 2016b), National Institute for Health and Care Excellence (2009b), and Institute of Medicine (2008)]. Professional cancer organizations

[e.g., American Society of Clinical Oncology (Andersen et al., 2014)] and government committees [e.g., National Institute for Health and Care Excellence (2009a)] are also advocating to increase screening and treatment of depression in oncology. For example, the American Society of Clinical Oncology (ASCO) states that it is the responsibility of the “clinical team” to ensure that all cancer survivors “be screened for symptoms of depression and anxiety at periodic times across the trajectory of care” (Andersen et al., 2014). They recommend utilizing the Patient Health Questionnaire or another validated depression screening tool. For those whose symptoms are concerning, ASCO suggests making referrals to evidence-based pharmacological and/or non-pharmacological interventions. Follow-up after making referrals entails bi-weekly or monthly contact to assess “follow-through and compliance” to the referred treatment. During follow-up, guidelines indicate providers should work to reduce barriers to treatment, propose alternative treatments with fewer barriers, or propose alternative treatments if the patient is adherent but symptoms are not reduced by 8-weeks post-screening (Andersen et al., 2014).

### **Screening and Treatment in General Medical Settings**

The utilization of such screening and treatment guidelines has been studied in general medical settings and primary care more than specialty medical settings like oncology, and many lessons can be gleaned from this wealth of research. One important caveat is that it is important to delineate *screening* from *screening with appropriate clinical diagnosis and follow-up*, as the evidence supporting each varies. Screening and the provision of screening results (e.g., depression score) to providers in medical settings has shown to increase the detection of depression two-to-three-fold (Pignone et al., 2002). However, several studies

have shown that the identification of depression alone is not an effective intervention for achieving significant mood symptom reduction (Meijer et al., 2011; Mojtabai, 2017; Thombs & Ziegelstein, 2014; Williams et al., 1999). In other words, a diagnosis is necessary yet not sufficient in order to reduce depressive symptoms.

Once a patient is identified as experiencing symptoms of depression, there remains the question of how to effectively address those symptoms, and research suggests discordance between evidence-based care guidelines, what medical providers may offer, and what patients are likely to pursue. For example, an early randomized controlled trial of screening in primary care found that rates of diagnosing depression increased whereas counseling, filling anti-depressant prescriptions, and mental health referrals did not, and there was no appreciable difference in depressive symptoms at 3-month follow-up (Williams et al., 1999). This may suggest that PCPs lack the skill or time to explain the potential benefits of a treatment, which could promote patient adherence.

Another issue is that PCPs may be failing to promote effective pharmacological treatment (Rhee, Schommer, Capistrant, Hadsall, & Uden, 2018). Further, PCPs report difficulty in choosing the best treatment and may prescribe antidepressant medication despite their belief that a patient may not benefit (Gidding et al., 2014). This shows that PCPs have struggled to treat their patients' depression and may benefit from additional help from providers with expertise in mental health.

Additionally, patients may not pursue treatment despite their providers' recommendation. Patient adherence with mental health treatment is lower when patients are referred to mental health providers outside of the context in which they receive their medical

care (Kessler & Stafford, 2008). Further, a meta-analysis showed mixed results regarding patient treatment utilization after receiving screening feedback (i.e., scores on depression measures), treatment recommendations, or antidepressant medications by PCPs (Pignone et al., 2002). Some of the studies included in this meta-analysis found improvements in the utilization of depression treatment while others did not. The authors could not identify any consistent explanation for these differences in treatment utilization (Pignone et al., 2002).

Based on findings that in-office care of depression with infrequent follow-up was failing to address patients' depressive symptoms, alternative models of care have been tested. In primary care, a particularly promising model has been to increase patient education and to have staff, often trained nurses, provide ongoing follow-up and monitoring of symptoms. One study of an enhanced care intervention utilized primary care staff and nurses to screen for and treat depression in six primary care clinics (Rost, Nutting, Smith, Werner, & Duan, 2001; Rost, Nutting, Smith, & Werner, 2000). Patients were screened for depression before their office visit and results were provided to the doctor prior to the appointment. During the visit, the doctor assessed depressive symptoms, gave the patient a psychoeducational handout and asked the patient to return in one week for a visit to treat the depressive symptoms. In this second appointment, the nurse re-assessed depressive symptoms, discussed the patients' treatment preferences, and addressed barriers to receiving mental health care with the patient. In addition, nurses provided additional follow-up either in-person (~40% of contacts) or by phone (~60% of contacts) on average 5.2 times in the following 8 weeks. These contacts were to assist the patient in obtaining medications (e.g., providing samples from the doctor or finding an organization to assist low-income patients with medication), assess adherence, and

continue to intervene regarding barriers to mental health care, if necessary. Compared to usual care, the enhanced care intervention was more effective in reducing depressive symptoms and increasing patient utilization of evidence-based care in patients beginning a new treatment but not in those who had recently received or were engaged in depression treatment prior to the start of the intervention (Rost et al., 2001). Similar programs have replicated these results, finding these programs effective in reducing depressive symptoms (Katzelnick et al., 2000; O'Connor, Whitlock, Beil, & Gaynes, 2009; Simon, VonKorff, Rutter, & Wagner, 2000), increasing utilization of evidence-based psychotherapy or antidepressant medication (K. B. Wells et al., 2000), and improving health (Katzelnick et al., 2000).

Studies from primary care settings highlight the complications inherent with implementing collaborative care, which is a structure of care that includes providers from various specialties including medical, social work, and counseling staff (Rost et al., 2001; Rost et al., 2000). Rost and colleagues found that while their enhanced care intervention was effective at reducing depressive symptoms and increasing treatment engagement, none of the clinics were able to continue their screening practices following the study period (Rost et al., 2001). Providers believed that “the intensive attention to depression could not be realistically maintained in routine practice” (Rost et al., 2000). Despite evidence of the improved outcomes of treating depression by internal staff with enhanced training, the intervention will not be effective if it is not viewed as sustainable. Further research is needed to understand what frequency of follow-up is necessary, which patients benefit most, and how the intervention can be tailored to be more sustainable.

## **Screening and Treatment in Oncology Settings**

Calls for the treatment of distress and depression in patients seeking care in a cancer setting are widespread in the clinical literature due to the prevalence and negative impact of distress on patients' lives. There are numerous potential causes of increased psychosocial distress in patients presenting for care in an oncology clinic, such as anticipating receiving a cancer diagnosis, having a current or past diagnosis of cancer, having a mental health disorder, or having significant psychosocial stressors (e.g., barriers to receiving medical or mental health care). Unfortunately, there is longstanding evidence that such concerns are inadequately addressed. In 2008, the Institute of Medicine published a report calling attention to the lack of standardized methods for detecting problems or improving psychosocial aspects of patients' health in oncology settings. The report states, "attention to psychosocial health is the exception rather than the rule in oncology practice today" (Institute of Medicine, 2008, p. xii). In fact, one study of guideline-consistent care for depression from around that time period found that less than one-third of oncology providers were aware of distress screening guidelines and only 14.3% of providers utilized a distress screening instrument in their clinical practice (Pirl et al., 2007). Further, 55% of cancer survivors reported that their providers had never discussed emotional well-being (Forsythe et al., 2013).

Since that time, rates of distress screening have improved. A study of oncology social workers showed that more than 75% of them were aware of screening guidelines and 54.6% of them screened for distress using a standardized tool (BrintzenhofeSzoc et al., 2015). While the majority of these providers are following the guidelines, they continue to acknowledge significant barriers to the implementation of standardized screening protocol such as patient

burden in paperwork completion and poor standardization of a clinic policy that resulted in a lack of control of when and if screening occurs (BrintzenhofeSzoc et al., 2015). In another study of compliance with distress screening recommendations, 62.6% of the nearly 8,500 patients seen at 55 cancer centers were screened and received an appropriate clinical response (e.g., referral to mental health care or a session with a social worker) to their distress screening results (Zebrack et al., 2017). However, adherence to guidelines varied widely between settings, with NCI-designated Comprehensive Cancer Center Programs adhering significantly *less* than community cancer programs, with 19.3% and 47.8% adherence, respectively (Zebrack et al., 2017). While a majority of patients were screened per the recommendations, a large proportion did not receive appropriate screening and treatment planning for follow-up care. Patients who were not screened, or whose screening results were not addressed by clinical staff, had higher rates of medical service utilization than those who were screened and received treatment or treatment recommendations. This demonstrates the healthcare cost of failing to detect and appropriately address distress in patients with cancer. Further, current implementation data focuses on the provision of distress screening, not depression screening. There is little research available to understand how oncology settings are currently addressing depression.

Jacobsen (2017) calls attention to the fact that the majority of research in psycho-oncology has focused on identifying opportunities to improve care and creating guidelines but has failed to evaluate implementation of guideline-based care. There exists an abundance of research on implementation of interventions for depression in general medical settings from which psycho-oncologists can learn. Currently, the quality and quantity of research

regarding the treatment of depression in oncology settings is low, and synthesis of existing literature based on current treatment practices is not promising. A review of seven randomized controlled trials in oncology found that there is “limited evidence that antidepressant medication alone or in combinations with psychological treatment may be effective” and that psychotherapeutic treatment alone has “no good evidence” that it is effective for reducing depressive symptoms (Walker et al., 2014, p. 901).

The most promising model of mental health care in psycho-oncology is collaborative care. Collaborative care has been found to be an effective treatment for depression in cancer survivors (Li et al., 2017). However, even in settings with collaborative care, there can be confusion among members of a treatment team about who is responsible for actually providing treatment after a patient reports experiencing mood symptoms (Sanchez, 2017). Further, collaborative care is costly and not feasible in many settings due to limitations on time and personnel and other existing barriers.

### **PATIENT NAVIGATION**

Historically, oncology providers faced similar organizational and patient barriers in increasing rates of cancer screening and treatment as they do with depression. As a solution, Dr. Harold P. Freeman and the American Cancer Society created patient navigation to increase rates of case identification and receipt of treatment in breast cancer in order to reduce health disparities in under-served communities (K. J. Wells et al., 2008). Patient navigation, as defined in oncology where it is predominantly used, is the provision of “logistic and emotional support needed to achieve the completion of diagnostic and treatment care” (Freund et al., 2008, p. 2). Typically, patient navigation programs aim to reach people

who face greater financial, logistic, and sociocultural barriers to receiving care such as patients with low income or who are underinsured. The goal of navigation is “the elimination of barriers to timely care across all phases of the health continuum” (Freeman, 2012, p. 2).

Freeman (2012) created principles of patient navigation that can be summarized by their focus on the process of navigation, its relationship to other health care services, and the role of navigators. As a process, patient navigation is “a patient-centered health care service delivery model” to promote the integration and flow of services for a specific patient by eliminating barriers that interfere with timely acquisition of services (Freeman, 2012, p. 1616). Navigation should have a defined starting and endpoint (e.g., after receiving an abnormal screening result and ending with the termination of cancer treatment). A patient navigation system should coordinate activities among phases of navigation (e.g., screening, to treatment, to termination) and should be helpful in connecting the patient to care in a fragmented (e.g., having multiple care sites) healthcare system. Navigators need to have a clear scope of practice that distinguishes them from other providers and their duties should be commensurate with their training. Navigation tasks requiring greater skill or expertise should be distinguished from those requiring less training and assigned to navigators accordingly in order to provide quality care and to keep the system cost-efficient. Tasks that a navigator typically assists a patient with include overcoming barriers within the healthcare system (e.g., coordinating care between members of the patient’s treatment team), providing appropriate education about the entirety of the condition from prevention and development to treatment and health maintenance, addressing logistic barriers to care, and providing psychosocial support directly or via referrals (K. J. Wells et al., 2008).

Patient navigation differs from case management. The term patient navigation was applied to the practice of nurses, trained staff, or patient peers addressing the specific medical concerns of their specialty population. A similar but distinct function has been served by case managers. Case management is the “coordination, integration and allocation of individualized care within limited resources” (Thornicroft, 1991) and aims to improve a patient’s overall health by providing resources “throughout the continuum of health and human services” (K. J. Wells et al., 2008). Freund and colleagues (2008) point out that the work of case managers, patient advocates, and community health workers all fit within the umbrella term of patient navigation despite having various titles and working in diverse health fields. Others acknowledge similarities but also make distinctions between the concepts. Wells and colleagues (2008) state that case management is distinct from patient navigation in that it focuses on a broad goal of improving health regardless of the medical condition or illness and includes long term follow-up as opposed to having a more defined interval of contact during the care process.

Health-centered navigation has generally improved patient health outcomes when utilized for various disease processes. Patient navigation has been utilized to serve patients with Human Immunodeficiency Virus (HIV), various cancer types, substance use, and mental illness. For HIV treatment, navigation was associated with increased treatment attendance (Stitzer et al., 2017), improved substance use treatment adherence (Metsch et al., 2016), and greater viral suppression (Metsch et al., 2016). However, these benefits were not sustained post-navigation (Metsch et al., 2016), and the results suggest that navigation should not be discontinued based on length of time. It may be more appropriate to discontinue individual

navigation when patients reach critical milestones (i.e., sustained treatment engagement, symptom remission). Among cancer survivors, navigation has been beneficial in early identification of cancer (Paskett, Harrop, & Wells, 2011; K. J. Wells et al., 2008) and increasing adherence to follow-up appointments following an abnormal screening result (K. J. Wells et al., 2008). Reviews suggest that some studies have found improved treatment outcomes while others have not (Paskett et al., 2011; K. J. Wells et al., 2008). These differing outcomes are difficult to explain due to the variability in methods of navigation and skills of navigators. One explanation could be that navigation is most effective for patients with greater need (e.g., more barriers, lower income, and lower educational attainment) which has been found in other reviews of the effectiveness of navigation (Freund, 2017). An additional explanation could be that patient navigation programs have placed greater emphasis on logistical barriers without using methods (e.g., motivational interviewing) that are appropriate for addressing psychological barriers to medical care.

### **Mental Health Navigation and Applications in Oncology**

Given that navigation has been implemented for use with cancer treatment, utilizing a similar navigation model to increase treatment for depression among cancer patients may be an effective solution and has been proposed by others in the literature. Mental Health Navigation (MHN) was proposed by Bieling and colleagues (2013) as a system to better identify and treat emerging mental illness, and thereby improve mental health outcomes. Bieling and colleagues (2013) suggest that a MHN program should serve the following functions:

Navigators assess the needs of patients to enable the most appropriate provision of assessment and treatment services in a timely and effective manner. Navigators offer comprehensive guidance on which services... will be most helpful. Navigators provide at least some evidence-based treatments ... as needed, but also share care with family practice settings and more specialized mental health services when needed. Navigators track and evaluate the trajectory of patients across different clinics and the associated outcomes. Navigators have authority to access the right level of care, ensure continuity of care, and improve communication of all health professionals during service delivery and follow-up. (p. 455).

The above proposed functions of MHN parallel the recommendations for implementing stepped-care to treat depression in oncology settings. MHN has a unique opportunity to address systemic, provider, and patient barriers. Current distress screening and follow-up processes are not consistently implemented due to limitations on time, provider expertise, and being a lower priority than physical health. While these are all barriers worth addressing within each institution, mental health navigation has a clear focus and expertise on addressing psychiatric diagnoses and is able to route patients to appropriate care within or outside of the specific treatment setting. Commonly cited patient barriers (e.g., desire to focus on cancer treatment during appointments, lack of knowledge about available psychological services) can be addressed by a provider with specialized training to tailor their approach to the individual patient, which has been emphasized as a necessary component of increasing engagement in psychological care (Mosher et al., 2009). However, MHN has not been widely implemented for depression in oncology settings and few similar programs have been implemented in the general population.

Findings from MHN in general settings may help guide the development and implementation of MHN in oncology. One such program has been created for navigating

youth with mental illness in Canada (Markoulakis, Weingust, Foot, & Levitt, 2016). This Canadian navigation program aims to meet the treatment needs of youth, ages 13-26, by assessing mental health needs, formulating a treatment plan, providing recommendations to the patient's family, and following up with the family regarding their satisfaction and outcomes of treatment. Families identified their desires during the development phase of this MHN program (Markoulakis et al., 2016). These families emphasized that navigators should have a thorough understanding of available treatments, provide support throughout the care process, and persist in navigating patients to treatments if prior treatments were not successful. They also expressed dissatisfaction with the standard practice of providers giving a list of resources without any follow-up regarding the patient's care. As such, during navigation, if the patient's needs are not met by the recommendations, the navigator creates a new navigation plan and the process is repeated until options have been exhausted or the patient no longer desires navigation services (Markoulakis et al., 2016). An evaluation of satisfaction with this patient navigation program revealed that overall satisfaction was associated with the frequency of contact, ability to recommend appropriate treatments, and the intake process (Fishman, Levitt, Markoulakis, & Weingust, 2017). Although very few mental health navigation programs exist, the previous work from other fields illustrate how mental health navigation may be effective in improving access to care.

### **Mental Health Navigation at the Moncrief Cancer Institute**

One prior analysis of the Mental Health Screening Assessment and Navigation (MH-SCAN) program at Moncrief sought to evaluate depression risk factors and if MH-SCAN effectively reduced depressive symptoms in patients with a history of cancer (Jester, 2017).

That evaluation found that certain demographic characteristics (diagnosis of a pre-existing mental illness, unmarried marital status, lower educational attainment, receipt of disability, and an annual household income between \$30,000 and \$40,000) were significantly associated with a greater likelihood of screening positive for depression. Patients who were navigated initiated the recommended treatment and had greater reductions in depressive symptoms than those who were unable to be navigated. This prior analysis was the first step in understanding if mental health navigation could impact depression in an oncology setting. An important next step is to evaluate for whom the program is effective. This would include examining which patients engage in MHN and to what extent are patients' depressive symptoms reduced. While a great deal of research uses clinically significant improvement (i.e., a 50% reduction in symptoms from baseline) as a benchmark for an effective treatment, remission is the ultimate goal of depression care and should be included in evaluations of program effectiveness.

### **THE HEALTH BELIEF MODEL**

The Health Belief Model (HBM) may help to explain why patient navigation is effective. The HBM is a socio-cognitive theory that attempts to identify factors that influence a person's decision to engage in a health care service (Rosenstock, 1974). The model proposes that a person's decision to seek care is dependent on the person beliefs about if he or she is susceptible to the illness (perceived susceptibility), if the illness would have a negative impact on their life (perceived severity), if seeking care would reduce the burden of the illness (perceived benefits), barriers to seeking care (perceived barriers), and perceived ability to change through therapy (self-efficacy). Additionally, cues to action, like

information about a condition provided by a primary care doctor or in a public health advertisement, can serve to increase information about the presence of, severity of, and treatments for an illness (see Figure 1). Although the current study is not explicitly designed to evaluate the various components of the HBM, its concepts can be used to understand how MHN may lead to improved mental health outcomes.

The HBM was originally developed in the 1950s to explain patients' behavior in engaging in preventive health screening and appointments and has continued to be refined and applied in understanding patients' behaviors as it relates to healthcare service utilization (Janz & Becker, 1984). Previous theoretical evaluations of the model have found predictive value in some, though often not all, of the components of the model (Henshaw & Freedman-Doan, 2009; Janz & Becker, 1984). The model has not been tested in predicting utilization of *mental health* services and is believed to have promise in this area (Henshaw & Freedman-Doan, 2009).

A navigation treatment model for depression is expected to be effective in reducing depressive symptoms and helping patients reach depression remission because it provides cues to action that can link a patient with effective treatment by addressing barriers. Each interaction with a navigator is another opportunity for the patient to receive information about their susceptibility and severity of depression, the benefits of treatment, and to address patient barriers to care. These interactions serve as cues to action that can motivate a patient to seek treatment and provide an opportunity for collaborative problem-solving and alliance building in order to overcome barriers.

Based on this model, patients with more severe depression would be more likely to engage in MHN due to receiving information from the navigator about their perceived susceptibility to and severity of depression. Also, the HBM indicates patients who endorse thoughts of wanting to die or who engage in self-harm would also have a higher perception of the severity of their mental health issues and would be more likely to engage in MHN. Patients acknowledgment of their symptoms during screening and experience of the symptoms serve as a cue to action and may make them more likely to engage in MHN.

Further, MHN is meant to be a bridge from detection of mental illness to treatment and remission. The HBM can be applied to predict which patients may achieve clinically significant depression symptom reduction and remission. Those who engage in more MHN sessions and who are able to be contacted with less time between MHN sessions would be receiving more information about severity, more opportunities for troubleshooting barriers, and more frequent cues to action. It is anticipated that navigation increases access to and motivation to pursue effective depression treatment. Combined, MHN and the receipt of mental health treatment would be expected to result in a reduction in depressive symptoms. Based on previous literature regarding stepped care for depression, those with lower depression severity (e.g., less severe symptoms and no endorsed suicidal ideation) benefit from supportive treatments for mild depression (e.g., increasing social support or attending a support group; Andersen et al., 2014). MHN may also serve as a source of social support for the patient which could lower depressive symptom severity or encourage them to utilize informal treatments (e.g., support groups) for mental health without initiating formal treatment. Thus, MHN may also be effective for less severe depression.

## AIMS

The overall aim of this project is to better understand the effectiveness of the MHN portion of the MH-SCAN program. While the initial evaluation of the program showed patients had a reduction in depression symptoms, the effectiveness of the program should also consider for whom it is effective. Understanding the patient characteristics associated with reduced depressive symptoms will help to determine areas of growth for the program (i.e., sample of patients for whom MHN should be tailored or have their depression targeted by a different model of care) and/or provide further support that MHN is an effective model of care for the patients in this population.

*Aim I:* To apply the Least Absolute Selection and Shrinkage Operator variable selection method to create a model to determine which patient characteristics predict engagement in MHN.

*Aim II:* To apply the Least Absolute Selection and Shrinkage Operator method to create a model to determine, among those who engage in repeat MHN calls, which characteristics predict (a) remission from depression (i.e., PHQ-9 sum of 4 or less) and (b) a clinically significant reduction of depression symptoms (i.e., 50% reduction in symptoms from baseline).

## HYPOTHESES

*Hypothesis I:* In a group of adult (age 18+) patients presenting to a community cancer clinic, I predict the statistical model will show that higher PHQ-9 scores and endorsement of suicidal ideation will increase the probability of engaging in repeat MHN calls after controlling for additional covariates.

*Hypothesis II:* In a subgroup of adult (age 18+) patients who present to a community cancer clinic and engage in repeat MHN calls, I predict the statistical model will show that having more total contacts with patient navigators, more frequent contact with a patient navigator, lower initial PHQ-9 scores, no endorsement of suicidality, initiating mental health treatment, and receiving psychopharmacological medications will increase the probability of achieving depression remission during the course of MHN after controlling for additional covariates.

*Hypothesis IIa:* The same predictions as outlined in hypothesis 2 are made for those who are most likely to achieve a clinically significant benefit. Specifically, in a subgroup of adult (age 18+) patients who present to a community cancer clinic and engage in repeat MHN calls, I predict the statistical model will show that having more total contacts with patient navigators, more frequent contact with a patient navigator, lower initial PHQ-9 scores, no endorsement of suicidality, initiating mental health treatment, and receiving psychopharmacological medications will increase the probability of achieving a clinically significant reduction in depression symptoms during the course of MHN after controlling for additional covariates.

## **CHAPTER THREE**

### **Methodology**

#### **OVERVIEW**

The UT Southwestern Moncrief Cancer Institute provides several medical and ancillary outpatient services to males and females of all ages seeking cancer-related care. This institution serves patients with and without insurance in Fort Worth and the surrounding area. Services provided include breast, cervical, and colorectal cancer screening; social work services, specialized exercise training, medication management, fertility preservation, and dietary counseling for cancer survivors; and psychology services for anyone with or affected by cancer. In order to address the high rates of depression and other mental health comorbidities that patients exhibit and consistent with previously described guidelines, providers at Moncrief implemented a program of integrated, universal screening and follow-up aimed primarily at reducing depression. Psychologists and psychology interns implement the MHN portion of MH-SCAN that provides assistance in accessing mental health care to patients with or without a cancer diagnosis. MHN provided by Moncrief is meant to increase motivation to seek treatment, reduce barriers to care, provide ongoing feedback to patients regarding their mental health, and facilitate effective treatment and symptom reduction for patients. MCI implemented the program as a standard-of-care beginning September 1, 2015 for all patients aged 13 or older who provided consent to be screened at the main Moncrief site as well as on the Survivorship Mobile Unit. The MH-SCAN program served patients from the time they were identified as having significant depressive symptoms through diagnostic resolution or symptom remission. As of August 6, 2018, the program

discontinued its universal screening due to funding limitations but has continued providing follow-up MHN for patients identified prior to this date as meeting criteria for navigation.

### **In-Clinic Mental Health Screening**

MH-SCAN utilizes a screening program called VitalSign<sup>6</sup> (VS<sup>6</sup>). VS<sup>6</sup> is a point-of-care web-based application for mental health screening developed and disseminated by the UT Southwestern Center for Depression Research and Clinical Care. VS<sup>6</sup> contains several mental health measures that can be administered through a tablet or desktop computer to patients. The software allows for the administration, storage, and tracking of results over time. The results are used for screening and symptom monitoring, as well as determining appropriate treatment recommendations. This facilitates the implementation of measurement-based care (MBC) for depression, in which data is used to inform treatment decision-making (e.g., to modify treatments if measured symptoms are not decreasing significantly). The VS<sup>6</sup> program was used to deliver the screening measures via tablet to the patient in person and via phone by a patient navigator reading the questions aloud and marking the responses on a computer. In addition to VS<sup>6</sup> data, MCI staff utilize information gained through patient report and from existing medical records to assess mental health and make informed treatment recommendations.

Upon presenting to the Moncrief Cancer Institute physical clinic location, patients who were scheduled with any provider and who gave consent for VS<sup>6</sup> were provided a tablet to complete screening measures upon arrival to an appointment. Consent for VS<sup>6</sup> was elicited through brief verbal description given by front desk staff, provision of a written description of the program on the tablet, and electronic recording of consent allowing sharing of VS<sup>6</sup>

data with staff who created the VS<sup>6</sup> program. The scores from the depression screening were used to determine which patients may benefit from ongoing contact, referrals, and symptom monitoring. Patients whose depression symptoms reached a pre-determined threshold (PHQ-9 sum was greater than or equal to 5) were deemed “positive” and were a candidate for mental health navigation. Those who declined to participate in VS<sup>6</sup> screening were not administered any mental health screening questions at that appointment or subsequent appointments for the next year and were not eligible for MHN.

### **Mental Health Assessment and Navigation**

Approximately 7 to 14 days after an initial positive screening, a trained patient navigator attempted to contact the patient for a first phone call to provide additional education about the purpose of the MH-SCAN program, receive assent for participation in the program, and then to initiate navigation activities during that call. During the first phone call, the patient completed a brief diagnostic interview (unless the patient had a documented mental health diagnosis in the medical record or the navigator was not qualified to make a diagnosis) and answered additional questions about demographics, mental health history, treatment history, and cancer history.

Navigation is comprised of repeat depression screening and the provision of individualized mental health treatment recommendations based on evidence-based treatments for a given diagnosis. Additional screening measures (e.g., an anxiety or pain questionnaire) could be administered if determined by the navigator to be clinically necessary. Examples of referrals or recommendations made during such phone calls include to seek counseling in a community mental health clinic, religious environment, or at Moncrief Cancer Institute; seek

pharmacological treatment from a medical provider; increase engagement with social support or in positive activities; engage in exercise; attend a support group; and/or speak with a social worker regarding insurance, financial, or other logistical needs. MHN was designed to continue in two-week increments to monitor symptoms, assist in increasing access to treatment, and evaluate treatment adherence until the patient's symptoms are in remission. Remission was defined for this program as scoring 4 or less on the PHQ-9. Following remission, the patient is contacted on a less frequent basis to ensure that remission is either sustained during that time or, if not sustained, to re-initiate mental health treatment. Figure 2 illustrates the navigation process.

## **PROCEDURES**

### **Design**

This evaluation of the MH-SCAN program is an empirical study of an existing standard-of-care program and, as such, lacked manipulation of variables, randomization, or masking of conditions from navigators. The UT Southwestern Institutional Review Board has reviewed the referenced project and determined that it does not meet the definition of human subject research at 45 CFR 46.102.

### **Patient Sample**

Patients were eligible for MHN if they screened positive for depression during their in-clinic visit with any Moncrief provider. Patients were adults (age 18 or older). Both cancer survivors and patients without a history of cancer were included in the sample.

## **Data Entry**

The analyzable dataset was created by extracting data from the electronic medical record (EMR) and VS<sup>6</sup>. Information recorded via the VS<sup>6</sup> software was stored on a secure server. A VS<sup>6</sup> data specialist coded a function to retrieve information (patient identifying information, dates of navigation calls, navigator who completed the call, mental health diagnoses, responses to the depression assessment, and other information not included in the current analyses) from the VS<sup>6</sup> server in the format of an Excel file. This file was merged with the file containing data retrieved from the EMR (described below). An Excel function (“IF” statement) was used to ensure that the merged VS<sup>6</sup> and EMR data were referring to the same case by matching patient identifiers.

Retrospective data was gathered from the EMR and entered into Microsoft Excel by three psychology doctoral candidates (including author NB) and one undergraduate psychology intern. Prior to extracting EMR data, these individuals received training in how to perform the electronic medical chart review. Certain variables (e.g., race) involved conflicting information within the EMR. Some discrepancies could be related to changes over time (e.g., marital status) while some discrepancies (e.g., race) did not have an identifiable cause. For this reason, a table was created which prioritized data extraction sources (i.e., location/source in EMR) to rely on for data coding. In addition, double data entry was utilized to allow identification and correction of data entry errors. An Excel function was used to check for and identify discrepancies across cells. All discrepancies were reviewed and corrected by one of the individuals responsible for entering data. All categorical variables (see Measures section below) with more than two levels were converted

into binary variables through dummy coding. Items were coded as “1” to indicate the presence of that variable, while “0” indicated its absence. For example, prior to dummy coding the variable employment status had 4 levels: unemployed, employed outside the home, employed in the home or homemaker, and retired. For dummy coding, three separate binary variables (employed, homemaker, and retired) were created. The non-coded variable, unemployed, became the reference. In dummy coding, the number of binary variables created is one less than the number of categories to avoid redundancy. Instead of adding another variable for unemployed, unemployed becomes the reference variable to which all other categories are compared (i.e., the absence of being employed, a homemaker, or retired, means the individual is unemployed).

### **Exclusion Criteria**

There were two exclusion criteria applied to the dataset. First, patients who did not complete the MHN call within 6 weeks of screening positive for depression were excluded from analyses. The protocol for MHN dictates that patients are contacted within 2 weeks of their positive screening result and that 3 attempts are made in 2-week increments to contact the patient. Therefore, all patients receiving MHN should be contacted within 6 weeks. Next, patients who had incomplete PHQ-9 data (i.e., were administered the PHQ-2 instead of full PHQ-9) were excluded from analyses due to the inability to compare partially and fully completed depression assessment scores.

## **MEASURES**

### **Predictor Variables**

#### *Sociodemographic Characteristics*

Self-reported demographic information was compiled from the electronic medical record. Sociodemographic variables include sex, age at first positive PHQ-9 screening, race, ethnicity, primary language, annual income, insurance status, and marital status. For information that may vary over time (i.e., income, insurance status, and marital status), data collected closest to the start of navigation was prioritized. See Appendix A for a description of each variable and information about the source of the data.

Race and ethnicity as reported by the patient (indicated in a patient-completed document or noted by a clinical provider) was compared to the information entered into the race and ethnicity fields in the patient demographic section of the EMR. For race, the rate of agreement was weak, ( $N = 454$ ,  $\kappa = .46$ ). For ethnicity, the rate of agreement was moderate, ( $N = 454$ ,  $\kappa = .730$ ). Because of this, the patient reported data was used, as opposed to the data entered into the EMR demographics field. In addition, race and ethnicity were originally coded as two separate variables, consistent with how race and ethnicity are defined in the current U.S. census and how they are collected in the EMR. The descriptive statistics showed that all Hispanic patients included in the sample identified as white. Further, research has shown that people who identify as Hispanic see their Hispanic ethnicity as their racial background and do not believe that their views on race and ethnicity fit within the official U.S. definitions (Gonzalez-Barrera & Lopez, 2015). Therefore, race and ethnicity were combined to create variables that combined white race and Hispanic ethnicity (Hispanic white and non-Hispanic white). This adds specificity and is more consistent with how Hispanic patients define themselves when asked. Also, a small number of patients identified as American Indian or Native American ( $n = 1$ ), Asian ( $n = 1$ ), or multiracial ( $n = 2$ ). These

three categories were collapsed into “other” for analyses. When dummy coded, race/ethnicity became three binary variables (Hispanic white, black or African American, other) with non-Hispanic white as a reference.

For marital status, there was variability in the way this category was described in the EMR, as different programs or departments used different forms to capture this variable. For example, one form used by the survivorship program identified marital status as single, married, widowed, or divorced. However, several patients identified verbally as “separated” to a navigator. To account for this and consistent with other research showing that not being in a relationship is related to experiencing a major depressive episode (Bulloch, Williams, Lavorato, & Patten, 2009), marital status was collapsed into two categories of either “single” or “partnered” based on their relationship status at the time of navigation.

### *Cancer History*

Reported cancer history was coded as present for patients with any history of cancer, including patients recently diagnosed, with multiple cancer occurrences, or in remission. Patients without a documented history of cancer were coded as not having cancer. This included patients whose EMR included a note indicating the patient did not have cancer and patients without any mention of cancer in their EMR. This was deemed as a reasonable assumption based upon the clinical experience of the lead psychologist at Moncrief, who agreed that patients and providers would report a history of cancer in the EMR, as this is relevant for medical treatment and could be used to prompt access to many additional services at Moncrief.

Several other cancer variables were included in the dataset but were not able to be included in the analysis. For more information about these variables, see Appendix A which details which information was collected from the EMR. Data that was specific to cancer survivors ( $n = 124$ , e.g., cancer site) could not be included in the analysis as it would be missing for patients without cancer ( $n = 83$ ). Further discussion on missingness in the context of the statistical methods used is provided in the Statistical Analyses section .

### *Depression Symptoms*

The Patient Health Questionnaire-9 (PHQ-9) is a screening tool for the presence and severity of depressive symptoms. The PHQ-9 is a self-report measure that assesses the nine symptoms of a major depressive episode and the level of impairment experienced as a result of these symptoms. The PHQ-9 was administered via a touch-screen tablet, a delivery method found to be reliable in a previous study (Fann et al., 2009). VS<sup>6</sup> screening begins with the Patient Health Questionnaire-2 (PHQ-2), the first two questions from the PHQ-9. The PHQ-2 assesses low mood and anhedonia, the cardinal symptoms of a depressive disorder. If the sum of these two questions exceeds three, the entirety of the PHQ-9 is administered. The nine items evaluating depression are answered on a Likert scale (0 indicates not at all; 1, several days; 2, more than half the days; 3, nearly every day).

The PHQ-9 is scored by summing the nine items assessing depression symptoms, with possible scores ranging from 0 to 27. There has been various scores, ranging from 8 to 11, recommended as the optimal cut-off for detecting a mood disorder (Gilbody, Richards, Brealey, & Hewitt, 2007; Kroenke, Spitzer, & Williams, 2001; Manea, Gilbody, & McMillan, 2012; Thekkumpurath et al., 2011; Wittkampf, Naeije, Schene, Huyser, & van

Weert, 2007). In the only published study of the psychometric properties of the PHQ-9 in an outpatient oncology clinic, a score of 8 or greater was considered to be the optimal cut-off with a sensitivity of 93%, specificity of 81%, positive predictive value of 25%, and negative predictive value of 99% (Thekkumpurath et al., 2011). In order to increase the likelihood of detecting sub-threshold and residual depressive symptoms and to reduce the likelihood of a type II error, MH-SCAN utilized a PHQ-9 score of 5 or greater as the cut-off for a positive depression screening result which deemed the patient appropriate for MHN.

For this QI evaluation, depression score was calculated as a sum of the first nine symptom questions on the PHQ-9. Baseline depression score refers to the patient's first in-clinic (vs. phone contact) depression score of 5 or greater. The date of this baseline score was utilized for calculating the time from the baseline depression score greater than 5 to the date of the first completed MHN call. Baseline date was also utilized in the calculation of the duration of engagement in the MHN program. This was utilized as patients with a shorter duration may have less depression symptom reduction based on the time required for most treatments to become effective (one month to three months). Following the baseline depression assessment, all other PHQ-9 depression assessments were completed on the phone with a patient navigator administering the measures verbally. For Spanish-speaking patients, an interpreter was present with the navigator and assisted in verbal administration of measures and other aspects of navigation. The patient's final PHQ-9 score is either the patient's final depression assessment score or, for a patient who achieved remission (defined below), the PHQ-9 score by which they achieved remission.

#### *Suicidal Ideation*

The presence of suicidal ideation at baseline was measured using question 9 of the PHQ-9, which asks “Over the last two weeks, how often have you been bothered by thoughts that you would be better off dead or of hurting yourself?” Response options are on a Likert-type scale (0, not at all; 1, several days; 2, more than half the days; 3, nearly every day), and a response of 1 or greater indicated the presence of suicidal/self-harm ideation. Question 9 of the PHQ-9 has been shown to have adequate sensitivity (0.69-0.92) and specificity (0.81-0.84) as a screening tool for suicidal ideation when compared to a structured interview (Uebelacker, German, Gaudiano, & Miller, 2011; Viguera et al., 2015). Sensitivity and specificity were 0.88 and 0.66, respectively, when compared to a definition of suicidal intent or recent suicidal behavior on the Columbia Suicide Severity Rating Scale (Na et al., 2018). Endorsement of question 9 has been associated with an increased risk of suicide attempt and death by suicide (Rossom et al., 2017; Simon et al., 2016; Simon et al., 2018). However, question 9 of the PHQ-9 has not been studied as a measure of suicidal ideation in oncology. For analysis, suicidal ideation was coded as a binary variable, the presence or absence of suicidal ideation.

#### *Engagement in Mental Health Treatment*

Specific mental health treatments utilized were coded as separate variables. The treatments coded were (1) psychopharmacological treatment (i.e., receiving or taking a prescription for a mental health condition), (2) psychotherapy, (3) support group(s), and (4) behavioral activation. Each was coded individually as “yes” (i.e., engaged) if there is evidence in the medical record that the patient self-reported utilization of the specific treatment (e.g., documentation of a prescription was only coded as the patient engaging in

that treatment if there was report of the patient taking the prescription). Engagement in a mental health treatment was only coded as “yes” if the treatment occurred during the navigation time period. A summary variable was created to indicate if patients engaged (yes or no) in any of the four types of mental health care treatments. The summary variable was used in the models to predict achievement of remission and clinically significant reduction in depression symptoms. The data from the specific treatments was unable to be used in exploratory analyses as planned due to the high percentage of missing data (ranging from 10% for therapy and 71% for behavioral activation). If there was no information about engagement in mental health treatment ( $n = 8$ ) or a patient denied engaging in one or more mental health treatments and information was missing about other forms of mental health treatment ( $n = 24$ ), the patient was coded as not having engaged in mental health treatment.

#### *Mental Health Navigation Characteristics*

Data from VS<sup>6</sup> regarding location (whether the PHQ-9 was administered in-office or by phone) and provider was utilized in addition to review of the medical record to identify if a screening was completed as a mental health navigation call. The total number of MHN calls the patient participated in was defined as either the total number of calls in which the patient participated in MHN or the number of calls until the patient reached remission (defined below). For those who achieved remission, the total number of MHN calls includes both the symptomatic assessments (i.e., PHQ-9 of five or greater) and the two consecutive assessments during which the patient endorsed sub-threshold or no depression symptoms (i.e., PHQ-9 sum of 4 or less). Navigation duration was calculated as the days from the baseline depression assessment to the final MHN call. Navigation frequency was calculated

as the mean, median and standard deviation of the number of days between navigation calls. To determine which value was more appropriate for analysis, a visual inspection of histograms and calculation of skewness and kurtosis were completed for the mean and median number of days between MHN calls (see Figure 3). The distribution of the mean was less skewed and leptokurtic than the distribution of median elapsed days between MHN calls, with skewness of 1.84 and 2.26 and kurtosis of 3.33 and 5.22, respectively. Based on this data, the mean days elapsed was used as a predictor in the analysis. The lasso does not require variables to have a normal distribution and thus, the variables were not transformed to change their distribution.

### **Outcome Variables**

The three primary outcomes are engagement in multiple MHN calls, depression remission, and clinically significant improvement in depression symptoms. For the first hypothesis, engagement in multiple MHN calls was a dichotomous outcome with patients with a total number of MHN calls of one compared to those who completed two or more.

The second hypothesis evaluated depression remission. Full remission from a depressive disorder is met if “no significant signs or symptoms of the disturbance” is present for the past two months (American Psychiatric Association, 2013). For this study, remission is defined as reaching a PHQ-9 score of 4 or less on two consecutive MHN calls. Due to the PHQ-9 being a measurement of symptoms experienced in the past two weeks, two consecutive measurements would evaluate depressive symptoms over one month. This criterion was chosen as a compromise which took into account the need to evaluate remission based on a dataset with a limited number of patients completing multiple MHN calls.

In addition, clinically significant benefit is defined as a reduction in depression symptoms of 50% or more from the patient's baseline to their final score and is frequently used as a measure of treatment effectiveness in mental health (Fava, Ruini, & Belaise, 2007). For Hypothesis 2, a clinically significant reduction in symptoms is defined as whether or not the patient achieved a 50% reduction in scores from baseline to final MHN call.

### STATISTICAL ANALYSES

Descriptive statistics are reported for all data that were considered for the model. For categorical variables, frequency is reported. Chi-square tests were used to assess differences in baseline characteristics between patients who were included and excluded in the analysis. For comparisons with a significant difference, as indicated by  $p < .05$ , adjusted residuals and Cramer's V will be reported. Cramer's V is a measure of the strength of the relationship between compared variables that accounts for sample size. For normally distributed continuous variables, mean and standard deviation are reported. For continuous variables with a skewed or platykurtic frequency distribution, median and interquartile range are reported. A one-way ANOVA was utilized to test for differences in age and baseline depression score between patients included and excluded (based on the days elapsed between positive baseline screening to MHN call or having incomplete PHQ-9 data) in the analysis. The Levene's test of equality was used to examine the assumption of equality of variances. Partial Eta squared was reported as a measure of effect size.

Analysis using logistic regression with the Least Absolute Shrinkage and Selection Operator (lasso; Tibshirani, 1996) was utilized to evaluate all hypotheses. By applying shrinkage to the regression parameters, this modeling paradigm selects the optimal set of

predictors from all predictors that are a-priori chosen and entered into the analysis predicting the outcome variable. The result can be interpreted as a logistic regression model with only those selected predictors having non-zero parameter estimates. This approach is often considered superior to stepwise variable selection procedures, which have been shown to suffer from several statistical issues, including biased standard errors of coefficient estimates, biased regression coefficients, artificially small p-values, and a potentially arbitrary set of selected variables when there is collinearity in the data (Harrell, 2001). The lasso also examines each candidate predictor entered for analysis independently while controlling for the influence of other variables on the outcome. Ten-fold cross-validation was used to identify the optimal amount of shrinkage, and thus the parameters to be included in the model (as well as their estimates). A seed was designated in order for the results to be reproducible with the same dataset. Specifying a value for the seed gives a starting point for the generation of a random number utilized in executing the cross-validation. The value of the seed can be chosen arbitrarily and has no relevance in interpreting the model. Because the sample size was relatively small, all data was used to build the model; as a result, no validation set was available.

To evaluate the efficacy of the fitted model, several measures will be interpreted. The accuracy of the model is the ratio of correct predictions to total predictions. The Brier score is the mean squared error of the prediction. It is calculated by taking the actual outcome, 0 or 1, subtracting the predicted probability, and calculating the square of this value; this process would occur for each case and the mean would be reported. The value of the score is not interpreted with any rule of thumb. Instead, a lower score indicates a more accurate model

(Rufibach, 2010). The no information rate represents the accuracy of a model which predicts that the most prevalent outcome, based on the actual data rather than the model's predicted outcome, occurs each time. The accuracy of the model will be compared to the no information rate using a one-sided hypothesis test, and a p-value will be interpreted to determine if the lasso model performs similarly to the no information rate. The Kappa statistic compares the predicted outcomes of the lasso model to the true outcomes to determine the level of agreement while taking into account agreement by chance. A higher kappa score indicates greater agreement.

Candidate predictors were chosen a-priori based on both the availability of information in the EMR and both clinical and research knowledge of which variables may impact the likelihood of being diagnosed with depression, seeking or receiving appropriate mental health care (i.e., components of the Health Beliefs Model), and achieving depression symptom remission. Variables were evaluated to ensure they meet assumptions for suitability for the analysis (e.g., no missing data).

Regarding missing data, the use of multiply imputed data, which has been shown to be superior to single imputation (van Ginkel, Linting, Rippe, & van der Voort, 2019), was considered. However, there are several issues that contributed to the decision to exclude *variables*, not cases, with missing data. First, the use of variable selection techniques with multiply imputed data is an ongoing area of research, and a consensus has not yet been reached. Further, in order to make a determination whether imputation is appropriate, both the amount of missing data and the cause of the missingness are important. Bennett (2001) warns that a substantial amount, 10%, of missing data will bias results. The nine variables

with missing data that were not used for analysis include education (20.29% of cases were missing), income (23.19%), federal poverty level (34.30%), genetic risk of cancer (68.60%), mental health diagnosis (15.46%), engagement in psychopharmacological treatment (32.85%), engagement in psychotherapy (18.84%), engagement in behavioral activation (73.91%), and engagement in a support group (71.01%). To ascertain if imputation is appropriate, the cause (i.e., missing completely at random, missing at random, or missing not at random) should be considered. Based on familiarity with the data set, it is believed that the missing values are not completely at random and are likely associated with another potential variable (e.g., provider, number of appointments at Moncrief) that is not in the dataset. Based on the amount of missing data, the unavailability of information to determine a cause for missing data, and the ongoing debate surrounding the use of multiply imputed data with the lasso, the decision was made to exclude the nine aforementioned variables with missing data from the lasso analysis.

Analysis of descriptive statistics and evaluating differences in characteristics between included and excluded patients were completed in IBM SPSS Statistics (version 25). The program, R (R Core Team, 2018), was used for statistical analysis of the hypotheses. The lasso was executed with the package *glmnet* (Jerome Friedman, 2010), and the packages *pROC* (Robin et al., 2011) and *caret* (Kuhn, 2019) were utilized to summarize the results from the models.

## **CHAPTER FOUR**

### **Results**

#### **SAMPLE**

Patients, aged 18 and older, who received a positive depression screening result between September 1, 2015 and June 11, 2018 were eligible to receive MHN (N = 991). Of the eligible patients, 445 patients responded to the MHN call. Data from the 445 MHN patients were compiled and de-identified for analysis. Patients (n = 238) were excluded due to not completing the MHN call within 6 weeks of screening positive (n = 193) or having incomplete PHQ-9 data (n=45). The final sample included 207 patients. See Figure 4 for the patient flow diagram.

Chi-square tests were completed to assess differences on categorical variables among the included patients (N = 207), patients who were excluded due to completing MHN more than 42 days after their baseline positive depression screening (n = 193), and patients excluded for having incomplete PHQ-9 scores (n=45; see Table 1). Variables were utilized in their categorical form, prior to dummy coding, in order to reduce the number of multiple comparisons. Spanish-speaking patients were more likely than English-speaking patients to be excluded due to not completing a call within 42 days,  $\chi^2 (2) = 19.66, p < .001, V = .21$ . Patients whose race/ethnicity was coded as other were excluded from the analysis due to the having too few observations for comparison in a chi-square test. Hispanic white patients were more likely to be excluded than non-Hispanic white patients for either reason and more likely to be excluded than Black patients for not completing a call within 42 days,  $\chi^2 (4) = 16.18, p = .003, V = .14$ . There were no significant differences between patients who were included, excluded based on days elapsed between positive screen and first completed MHN or

excluded based on having incomplete PHQ-9 data on sex, employment, income, insurance, marital status, education, reported cancer history, or mental health history.

A one-way ANOVA was completed to assess for statistically significant differences on continuous variables among patients who were included, excluded due to completing MHN more than 42 days after their baseline positive depression screening ( $n = 193$ ), and patients excluded for having incomplete PHQ-9 scores ( $n = 45$ ). Both age and baseline depression score met the assumption of homogeneity of variances, as assessed by Levene's test for equality of variance ( $p = .45$  and  $p = .12$ , respectively). There was not a significant difference between patients who were included, excluded based on days elapsed between positive screen and first completed MHN, or excluded based on having incomplete PHQ-9 data on age,  $F(2, 442) = 0.12$ ,  $p = .89$ ,  $\eta^2 = .001$  (see Table 2). There was a significant difference in baseline depression score between patients who were included, excluded based on days elapsed between positive screen and first completed MHN, or excluded based on having incomplete PHQ-9 data,  $F(2, 442) = 3.66$ ,  $p = .03$ ,  $\eta^2 = .016$ . Tukey post hoc comparisons revealed that patients who were excluded due to having incomplete PHQ-9 data during MHN calls had a lower mean baseline depression score than patients who were included in the dataset ( $p = .02$ ) and patients who were excluded based on days elapsed between baseline and first completed MHN call ( $p = .04$ ).

## **HYPOTHESIS I: PREDICTORS OF ENGAGEMENT IN MULTIPLE MENTAL HEALTH NAVIGATION CALLS**

Patients (N=207; see Table 3) were mostly female (88%) and identified as Hispanic white (39%). On average, patients were 50 years old, (SD = 10.98). The majority of patients were English-speaking (76%), single (53%), and had a history of cancer (60%).

Hypothesis I predicted that the statistical model would show that higher PHQ-9 scores and endorsement of suicidal ideation would increase the probability of engaging in multiple MHN calls after controlling for additional covariates. For the analysis (N = 207), 15 candidate variables were entered in to the lasso to predict whether or not a patient would engage in multiple MHN calls. These variables included sex, age, language, marital status, race/ethnicity (black, Hispanic white, and other, with non-Hispanic white as reference), insurance status (publicly insured and privately insured, with uninsured as reference), employment status (employed, homemaker, and retired, with unemployed as reference) and mental health and health variables (reported cancer history, baseline presence of suicidal ideation, and baseline depression severity).

The lasso retained one predictor, being employed. The odds ratio indicated that the odds of someone who is employed engaging in multiple MHN calls are 0.78 times less than someone who is unemployed ( $\beta = -0.25$ ; see Table 4). Area under the ROC curve (See Figure 5) shows that the model's ability to predict engagement in multiple MHN calls is greater than chance (AUC = 0.59, 95% DeLong CI = 0.52 – 0.65). However, the magnitude of the fitted probabilities (min = 0.56, max = 0.62) indicate that all patients would be predicted to engage in multiple MHN calls (assuming a cutoff of 0.5), meaning the model performs equivalently to the no information rate (accuracy = 0.604, NIR = 0.604,  $p = 0.530$ ). The amount of agreement between the model and outcome after accounting for chance agreement indicated

poor agreement,  $\kappa = 0$ . The Brier score, the mean squared error of the model's predicted outcome compared to the sample's actual outcome, was 0.24. See Table 5 for a summary of the measures of model accuracy.

## **HYPOTHESIS II: PREDICTORS OF DEPRESSION REMISSION**

Patients ( $n=125$ ; see Table 6) were included in this analysis only if they had two or more MHN calls. Patients included in this analysis were predominantly female (90%), single (55%), and uninsured (50%). Patients were racially and ethnically diverse and were on average 50.64 years old ( $SD= 10.31$ ). Twenty-four patients (19%) achieved remission while 101 did not achieve remission.

Hypothesis II predicted the statistical model would show that having more total contacts with patient navigators, more frequent contact with a patient navigator, lower initial PHQ-9 scores, no endorsement of suicidality, initiating mental health treatment, and receiving psychopharmacological medications would increase the probability of achieving depression remission at the end of MHN after controlling for additional covariates. For the lasso ( $n = 125$ ), candidate predictors included sex, age, language, race/ethnicity (Hispanic white, black, and other, with non-Hispanic white as reference), insurance status (privately insured, publicly insured, and uninsured as reference), employment status (employed, homemaker, retired, and unemployed as reference), and marital status. Mental health and medical variables (reported history of cancer, presence of suicidal ideation at baseline, depression score at baseline, having a Moncrief psychology provider, and any reported engagement in a mental health treatment), and MHN variables (number of MHN calls, mean time between MHN calls, duration from baseline to final MHN call) were also included as

candidate predictors. Six predictors were retained by the lasso, suggesting they had predictive power with respect to estimating the likelihood of remission. Table 7 shows the coefficients, odds ratios, and other statistics for the retained predictors. The area under the ROC curve shows that the model's ability to predict patients' achievement of remission is greater than chance (AUC = 0.79, 95% DeLong CI = 0.70 – 0.89). Figure 6 depicts the ROC curve of the lasso model for depression remission. All estimated probabilities of achieving remission were below 0.5 (min = 0.04, max = 0.49) suggesting that none of the patients would be predicted to achieve remission (assuming a cutoff of 0.5); again, this is an indication that the model's performance is equivalent to the no information rate (the proportion of patients who did not remit, accuracy = 0.81, NIR = 0.81,  $p = 0.55$ ). The amount of agreement between the model and outcome after accounting for chance agreement indicated poor agreement,  $\kappa = 0$ . The Brier score was 0.13. Table 4 contains a summary of the model's measures of accuracy.

The odds of a Spanish-speaking patient achieving remission are 1.42 times higher than an English-speaking patient. Patients who identified as Hispanic white were 1.40 times more likely to achieve remission than a non-Hispanic white patient. Patients who were homemakers were 1.80 times more likely to achieve remission than patients who were unemployed.

Patients with a public insurance plan (e.g., Medicaid) were 0.65 times less likely to achieve remission than patients without insurance. Patients who endorsed suicidal ideation at baseline were 0.65 times less likely to achieve remission than patients without suicidal ideation at baseline. The odds of achieving remission were 0.89 times less for every one-unit

increase in MHN calls received, indicating that those with a higher number of calls were less likely to achieve remission than those with fewer calls.

### **HYPOTHESIS IIA: PREDICTORS OF A CLINICALLY SIGNIFICANT REDUCTION IN DEPRESSION SYMPTOMS**

Patients (n=125; see Table 6) included in this analysis are the same as those included in the analysis of hypothesis II. Fifty-one patients (41%) achieved a clinically significant reduction in symptoms while 74 did not achieve a clinically significant reduction in depression symptoms.

Hypothesis Iia predicted the statistical model would show that having more total contacts with patient navigators, more frequent contact with a patient navigator, lower initial PHQ-9 scores, no endorsement of suicidality, initiating mental health treatment, and receiving psychopharmacological medications would increase the probability of achieving a clinically significant reduction in depression symptoms at the end of MHN after controlling for additional covariates.

For this analysis (n = 125), the model to predict the achievement of a clinically significant reduction in symptoms (i.e., a reduction of 50% from baseline to final MHN call) retained seven variables out of 20 candidate predictors (the same 20 included in the analysis of hypothesis II). Refer to Table 7 for a list of the predictive variables and to Table 5 for a summary of the model's accuracy statistics. The area under the ROC curve shows that the model's ability to predict patients' achievement of a clinically significant reduction in depression symptoms is greater than chance (AUC = 0.73, 95% DeLong CI = 0.65 – 0.82). The amount of agreement between the model and outcome after accounting for chance

agreement indicated fair agreement,  $\kappa = 0.27$ . The Brier score was 0.21. Figure 7 depicts the ROC curve of the lasso model predicting which patients achieve a clinically significant reduction in depression symptoms.

Estimated probabilities of achieving a clinically significant reduction in depression symptoms ranged from 0.16 to 0.64, indicating that the model had better discriminative ability than the previous two models as it predicted the outcome in both directions, that some patients would achieve the outcome (i.e., clinically significant reduction in symptoms, assuming a cutoff of 0.5) and some would not. According to the one-sided hypothesis test, the model performed significantly better than the no information rate (accuracy = 0.67, NIR = 0.59,  $p = .04$ ). Spanish-speaking patients were 1.27 times more likely to achieve a clinically significant reduction in symptoms than English-speaking patients. Hispanic white patients were 1.35 times more likely than non-Hispanic white patients to achieve a clinically significant reduction in symptoms. Patients with a partner were 1.57 times more likely to experience a clinically significant reduction in symptoms than those without a partner.

Employed patients were 0.66 times less likely to achieve a clinically significant reduction in depression symptoms. Patients with public insurance were 0.69 times less likely than patients who were uninsured to achieve a clinically significant reduction in symptoms. Patients who racially identified as other were 0.63 times less likely to achieve a clinically significant reduction in depression symptoms than patients who identified as non-Hispanic white. For every one-unit increase in MHN calls, the patient's odds of achieving a clinically significant reduction in depression symptoms were multiplied by 0.93, equivalent to a 7% reduction in odds.

## **CHAPTER FIVE**

### **Conclusions and Recommendations**

#### **DISCUSSION**

##### **Engagement in Mental Health Navigation**

For hypothesis I, the hypothesis that higher depression score and presence of suicidal ideation would increase the probability of a patient engaging in MHN calls, was not supported. The results of this quality improvement evaluation revealed that, based on the current sample, characteristics for predicting which patients will participate in a phone mental health navigation program remain unclear. The model created with the lasso method was not able to predict which patients would engage in multiple MHN calls better than a model that simply predicted that the more common outcome would happen 100% of the time (i.e., all patients engage in multiple MHN calls). Notably, patients' baseline depression score and presence of suicidal ideation also were not predictive of engagement in multiple MHN calls as hypothesized, as they were not retained as predictors by the lasso. These two variables served as indicators of the severity of patients' depression symptoms. The Health Belief Model (HBM) would suggest that patients with more severe depression would be more motivated to engage in a health behavior as they would likely perceive the threat of the condition on their wellbeing to be greater. On the other hand, patients' depressive symptoms can also serve to reduce perceptions of their efficacy for addressing the condition. Further, the American Society of Clinical Oncology discusses the potential for nonengagement in mental health treatment in their depression screening guidelines and posits that severe depression symptoms (e.g., fatigue, worthlessness, lack of interest) can work in opposition to

engaging in mental health promoting activities (Andersen et al., 2014). It is possible that these depressive symptoms may be acting in opposition to the goal of MHN within this sample, and thereby limited these variables' ability to predict engagement with MHN.

While the model did not perform better than a prediction that all patients would engage in multiple MHN calls, it did indicate that being employed outside of the home is a barrier to engagement in two or more MHN calls. There are several potential reasons for an employed patient to not engage in the program. If we use the framework of the Health Belief Model, the patients may perceive their mental health problems to be less severe as they continue to function in their daily lives. Further, the MHN calls were made during traditional business hours, and patients may have either logistic barriers (e.g., reduced availability, limited access to their personal phone) or greater emotional barriers (e.g., potential stigma of a co-worker overhearing a discussion of mental health) that would interfere with them receiving these cues to act on their mental health symptoms. Working patients with greater demands on their time may have lower self-efficacy for engaging in mental health treatments; this impediment to engaging in mental health treatment may lead them to believe that the goal of MHN, to assist patients in accessing effective treatment, is not realistic in their current circumstances.

### **Depression Remission and Clinically Significant Reduction in Depression Symptoms**

Hypothesis II and IIa had the same hypotheses regarding characteristics of patients who would achieve remission and who would achieve a clinically significant reduction in depression symptoms and both utilized the same candidate predictors. Only one of the hypothesized predictors was influential in either model. The presence of

suicidal ideation made a patient less likely to achieve remission; however suicidal ideation was not influential in predicting if the patient would achieve a clinically significant reduction in symptoms. This is an interesting finding, as many depression treatment trials utilize reduction in symptoms as opposed to remission as their outcome. This model suggests that the two outcomes (total remission vs. clinically meaningful reduction in symptoms) should be considered separately, as the predictors of each outcome may differ. If complete remission is the ideal goal in the treatment of depression and is more difficult to achieve, finding predictors of remission is important and should be pursued as an equally, or perhaps more, important outcome than evaluating a clinically meaningful reduction in symptoms. This could assist in creating treatment algorithms to funnel patients into treatments that are predicted to have the best chance of helping the patient achieve depression remission.

Interestingly, sociodemographic characteristics were the most common predictors of both remission and clinically significant reduction in depression symptoms. The findings from this study indicated that being Spanish-speaking and/or Hispanic White, were beneficial for increasing the likelihood of achieving remission and/or experiencing a clinically significant reduction in symptoms. The HBM suggests that sociodemographic factors may exert an effect on patients' perceptions of a health threat and expectations regarding care and the likelihood of the condition impacting their lives. Previous evaluations of Hispanic female patients' views toward mental health treatment found that patients with depression are receptive to receiving mental health treatment, with a preference for individual counseling, faith-based services, and social support (Nadeem,

Lange, & Miranda, 2008). These patients' receptivity plus openness to utilizing multiple options for mental health treatment may be effective in allowing patients to access care in an area with sparse resources for low-income patients. It also may make these patients more receptive to engaging in MHN to supplement their care. Anecdotally, several Hispanic and Spanish-speaking patients expressed their gratitude to our navigators for continually "checking on" them and helping them to problem-solve barriers to receiving effective mental health and medical care (e.g., recommending a PCP to rule-out medical issues masquerading as depression or to receive antidepressant medication).

It was also hypothesized that patients with a higher number of calls and those who received more frequent calls would benefit more from MHN due to receiving more cues to action. In stark contrast to this prediction, the higher the number of MHN calls, the lower the predicted probability was of achieving remission or a clinically significant benefit, at least in this study sample. The distribution of MHN calls was positively skewed, indicating that the number of patients with fewer calls was much higher than the number of patients with more calls (six or greater; See Figure 8). Further, the average depression score was higher for patients with a higher number of MHN calls (See Figure 9). These higher depression scores of a small number of patients would carry a large weight (mathematically) in determining the impact of the number of MHN calls on achieving depression remission or a clinically significant reduction in symptoms. This is interesting and may suggest that there is an ideal "dose" of navigation and an amount that is no longer effective in achieving the specific goals of the program (i.e., to help patients access care and to achieve depression remission).

Perhaps patients who continue to engage in MHN see MHN itself as a form of therapy and this may lead to patients not seeking a higher level of care. This could be particularly relevant for patients with limited financial means as they may be unable to afford another type of mental health treatment. Income was not able to be included as a predictor in the current study due to incomplete data, however this variable has potential to increase the understanding behind why MHN is effective for some patients and not others.

Other potential barriers to engaging in MHN could include some unmeasured, underlying patient characteristics, including personality pathology (i.e., dependency) or treatment-resistant depression. Additionally, if a patient is experiencing significant life stressors, receiving multiple MHN calls could be perceived as an added burden and decrease the likelihood of engaging in mental health treatment. Many of these potential explanations could be explored through a qualitative follow-up study to assess patients' perceptions about MHN.

Finally, it was anticipated that MHN would benefit patient recovery from depression by increasing access to mental health treatment. However, actual patient self-reported engagement in mental health treatment was not predictive of either reduction of depression symptoms or remission in this study. Unfortunately, this dataset lacks more specific information about which treatments patients were utilizing and therefore limits the ability to draw more specific conclusions. There is a growing body of literature aimed at creating predictive models to match patients with the treatment modality that would be most effective for them. While it is possible that patients are not utilizing or do not have

access to the most effective treatment for their depressive symptoms, it is also possible that the critical predictor variables for determining the most effective treatment have yet to be identified or investigated. In order to refine predictive models that seek to identify effective treatments for each patient, it will be important to continue evaluating patient characteristics, perceptions of MHN, as well as novel predictors.

## **LIMITATIONS**

### **The Benefits and Drawbacks of Electronic Medical Record Research**

A major limitation of this project was the amount of missing data due to having used information gathered from the EMR. Several issues contributed to the decision to not utilize an imputation method. First, the mechanism behind the missing data could not be determined. Also, there is not a consensus in the field on the best method for the interpretation of lasso models utilizing multiply imputed data. For these reason and the quantity of missing data for variables that were intended to be included as candidate predictors, several variables were not included in the analyses as originally planned. There are frequently multiple sources of data within an EMR and when the data is conflicting, the “truth” is difficult to ascertain. Any encounter with a staff member or provider who can add to a patient’s EMR is another source from which a researcher can extract data. This is a major benefit in terms of the scope and amount of information that is potentially available on thousands of “real-world” patients, not recruited participants.

However, patients with fewer interactions with a provider with EMR access will have less data. This was evident in our attempts to gather several variables including relevant medical information (e.g., cancer history). Further, the information that different

providers find pertinent to record in the EMR varies. For example, for this sample of participants, insurance information was documented consistently across providers from different specialties, while educational attainment was almost exclusively collected by providers in social work or psychology. Determining the cause of missing data, and thus planning on how to limit the impact of missingness, is also more complicated when compared to other types of research. When considering whether data is missing completely at random, at random, or not at random, it is important to recognize that the majority of the information available is dictated by the providers with whom the individual interacts. Thus, the missing data for a variable can much less readily be assumed to be related to another patient characteristic as the patient was typically not involved in determining which information was recorded. To give an example from another field, survey research may find that patients of particular racial groups are more likely to be missing data on immigration status and could attempt to test this relationship and account for systematic differences through an imputation process. Because there are so many potential causes of missing EMR data, it is more difficult to determine the missingness mechanism and therefore reliably apply imputation methods for missing data.

Another limitation of having multiple sources of information is that there is little to no way to ensure that all people entering data conceptualize and code data equivalently. There can be no “data dictionary” that is uniformly applied by people in every field and of every profession in a large healthcare system. It is also not feasible to address the sources of data discrepancies due to the large number of people contributing to the data.

Even for a concept such as race, there was significant variability between patient report and what was recorded for the patient (by others) in the EMR. From investigating potential causes of this discrepancy, the policy that race and ethnicity were required (i.e., a “hard stop”) for creating a new EMR patient record was reported as a major potential contributor. While there was an option to record “unavailable/unknown,” it was observed that the use of “some other race” was often used when information from patient report contradicted this data. Others have also found discrepancies and a high rate of “unknown race” values in the recording of racial and ethnic information across medical databases (Craddock Lee, Grobe, & Tiro, 2015).

Further, the process of collecting the data through EMR review can be cumbersome, particularly if pre-defined data fields are not used. The majority of the data gathered from the EMR for this project was in narrative notes or scanned documents and was not available in pre-defined fields. Data that is entered into defined fields can often be retrieved by programming code to retrieve the data and can be exponentially less time-consuming as the number of cases increases. However, as noted above, even when these pre-defined fields are used and populated, there can be a significant discrepancy between what is observed vs. patient-reported (as in the case of race/ethnicity data) and therefore, the convenience of these pre-defined fields may not outweigh the accuracy of the data collected.

Potential ways to improve the reporting of information in the EMR include standardizing as much of the documentation processes as is possible. This would include having training requirements that would teach the intended meaning and importance of

collected data. Having standardized forms for all patients and ensuring that documentation of the information in forms is completed (including scanning completed documents) provides a rich and reliable source of data. The use of standardized note templates can also ease and provide structure for the process of documentation. Further advances in statistical methods for imputation and the analysis of imputed data can also help to reduce the impact of missing data in EMR research.

### **Data and Statistical Analysis Limitations**

While the statistical method utilized to evaluate the hypotheses has the benefit of being able to evaluate many predictors from a small sample, potentially important predictors were not retained in this model. The majority of candidate predictors entered into analysis were sociodemographic and many variables were excluded due to missing data. It is possible that the inclusion of many more variables related to health, mental health, mental health treatments, and perceptions receiving medical or mental health services would increase the ability to predict the likelihood of benefitting from a MHN program.

Another major limitation of this study is that a significant portion of the total number of cases were excluded in the analysis. It is possible that with a larger sample, the model would have been able to make more robust predictions or to be able to identify additional predictors. The current sample was small and likely not representative of all patients at Moncrief or the general population. Approximately half of the sample was excluded due to issues in the implementation of the MH-SCAN program (e.g., time lapse between the positive screening in the office and the first MHN call). For the majority of

the program's implementation, there was only one Spanish-speaking navigator or one navigator assigned to make calls with the help of a Spanish interpreter at any time. This likely contributed to the high number of excluded Hispanic white and Spanish-speaking patients. This limits the generalizability of the findings. Excluded patients also had significantly lower baseline depression scores. This is also likely linked to an issue in implementation of MHN; some patients received the PHQ-2 and those who endorsed a low frequency of depressed mood or lack of interest in the past two weeks did not have the remainder of the questions administered (i.e., the full PHQ-9). The finding that excluded patients have lower depression scores may indicate that data included in this analysis is biased toward patients who are at least moderately depressed.

Because the sample was small, all cases were retained to create the model. This did not allow for testing the model on a separate data set. The accuracy of the models would likely be reduced when applying the models to a validation dataset. Because of the limitations of the project, these findings should be utilized as hypothesis generating and to inform future research.

### **RECOMMENDATIONS FOR MH-SCAN PROGRAM IMPROVEMENT**

Results from this project can inform ways in which the MH-SCAN can be improved. For example, this program aimed to reach all patients identified as being at greater risk of having depression (based on an initial screening questionnaire) but may not be effectively overcoming barriers for those who are employed. Regarding employment, a major pitfall of the implementation of MHN was that calls were made during business hours only which likely contributed to the difficulty in reaching and

maintaining MHN relationships with working individuals. This could be remedied by changing the time of day that calls are made to include evening hours and varying call times (e.g., calling during the morning, afternoon, and evening on different days of the week), however this would add complexity for navigators whose schedules would become more irregular. An alternative would be to utilize different modes of assessment such as via text, email, or an online portal. While these methods have other potential issues (e.g., the need for a provider to be able to address suicidal ideation endorsed via one of these methods without already having contact with the patient), they should be explored as potential ways to access patients who may not be available during traditional work hours or who prefer these alternate methods of assessment.

Another goal for improvement of the implementation of the program would be to ensure that Spanish-speaking patients have an equal opportunity to engage in the program by hiring a navigator who speaks Spanish or by ensuring that an interpreter is scheduled regularly to assist in making MHN calls.

Another barrier that comes from observation of patient reactions to receiving a MHN call is that some patients seemed skeptical of the goals of MHN initially. Some patients had not been informed about the MH-SCAN program by their provider during their appointment and reacted to the initial MHN calls as if they were participating in research or in some way doing the navigator a favor. This appeared to be reduced over time as patients became more accustomed to MHN calls and as navigators made adjustments to their explanation of the program. In order to reduce the potential for this happening, it would be prudent to develop a brief yet comprehensive description of

navigation to include in the in-clinic screening process, preferably as an integrated part of the patient completing the depression and other mental health screening questionnaires.

From an implementation standpoint, providers faced barriers to successfully implementing the MH-SCAN program. These difficulties included having uninterrupted time to complete MHN calls and navigator burnout. Burnout was related to spending hours attempting to reach patients without success, patients' lack of familiarity with MHN and subsequently attempting to engage patients in a discussion about their mental health symptoms without having met them and developed rapport. This is likely a barrier that exists in all MHN programs in which the contact is initiated by a navigator, as opposed to being initiated by a patient as in the Canadian MHN program (Markoulakis et al., 2016). Creating systems like a database to simplify and automate planning and decision-making may also make navigation less burdensome on navigators.

Future quality improvement projects of MHN should continue evaluating how to address the mental health needs of patients not receiving adequate care for depression and other mental health conditions. This could be accomplished through a larger scale study that randomizes patients to different methods or frequencies of navigation. Input from both patients and providers should be elicited in the process of creating and maintaining a MHN program in order to ensure that the program is sustainable and beneficial based on the goals of all parties involved.

## **FUTURE DIRECTIONS**

Further study of mental health outreach programs could attempt to identify additional characteristics to predict remission. The identification of predictors for

depression response is a burgeoning area of research (e.g., (Huang et al., 2014) and could one day lead to being able to individualize treatment recommendations based on patients' baseline characteristics. An alternate goal in examining the evidence from this program would be to determine which characteristics are predictive of having an increase or minimal change in symptoms. Assessing characteristics of patients whose symptoms remain the same or increase could help to identify avenues for further program development in order to reach patients with treatment-resistant depression or patients with chronic depression who are not receiving adequate treatment.

Some potential avenues for clarifying patients' motivation for engaging in MHN and their perceptions of how (or if) this program was helpful could be to complete a qualitative analysis of patients' feedback regarding the program. Other areas for future study of MHN include continuing to search for additional predictors within the EMR for depression symptoms reduction and remission based on other theories of behavior change, addressing some hypothesized barriers to engaging in MHN, and finding alternative collaborations to expand the network of providers who can lend expertise and assist in patient care.

## **CONCLUSION**

Depression symptoms can have a detrimental effect on patient health and wellbeing. While many organizations have called for universal screening and increased treatment of depression, the method of how to best ensure that the identified patients receive effective treatment remains unclear. Currently, collaborative care appears to be the most effective method of reducing depression symptoms but is often seen as not being

feasible in today's healthcare environment. Mental health navigation is being implemented to attempt to identify if less intensive interventions can be helpful to ensure patients receive the care necessary to combat depression. This project identified some characteristics of patients who would later achieve depression remission and a clinically significant reduction in depression symptoms and found that, once patients receive navigation, they are likely to engage in it for multiple sessions. Further study of MHN is necessary to improve the implementation of MHN programs and when this is accomplished, to disseminate findings for other providers to be able to learn from, adapt, or adopt effective strategies for targeting depression symptoms.

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Table 1

*Sociodemographic Characteristics of Included and Excluded Patients*

| Variable       |                           | Included |     |       | Excluded |     |       |                |     |       | $\chi^2$ | <i>p</i> | <i>V</i> |
|----------------|---------------------------|----------|-----|-------|----------|-----|-------|----------------|-----|-------|----------|----------|----------|
|                |                           | N = 207  |     |       | Time     |     |       | Incomplete PHQ |     |       |          |          |          |
|                |                           |          |     |       | n = 193  |     |       | n = 45         |     |       |          |          |          |
|                |                           | n        | %   | Res.  | n        | %   | Res.  | n              | %   | Res.  |          |          |          |
| Sex            |                           |          |     |       |          |     |       |                |     |       | 0.06     | .97      | .01      |
|                | Male                      | 25       | 12% | 0.0   | 24       | 12% | 0.2   | 5              | 11% | -0.2  |          |          |          |
|                | Female                    | 182      | 88% | 0.0   | 169      | 88% | -0.2  | 40             | 89% | 0.2   |          |          |          |
| Race           |                           |          |     |       |          |     |       |                |     |       | 16.18    | .003     | .14      |
|                | Non-Hispanic White        | 70       | 34% | 2.2   | 49       | 25% | - 1.3 | 9              | 20% | -1.4  |          |          |          |
|                | Hispanic White            | 80       | 39% | - 3.4 | 108      | 56% | 3.4   | 21             | 47% | 0     |          |          |          |
|                | Black or African American | 53       | 26% | 1.7   | 31       | 16% | - 2.6 | 14             | 31% | 1.6   |          |          |          |
|                | Other <sup>a</sup>        | 4        | 2%  | -     | 2        | 1%  | -     | 1              | 2%  |       |          |          |          |
|                | Missing                   | 0        | 0%  |       | 3        | 2%  |       | 0              | 0%  |       |          |          |          |
| Language       |                           |          |     |       |          |     |       |                |     |       | 19.66    | < .001   | .21      |
|                | English                   | 158      | 76% | 3.8   | 108      | 56% | - 4.4 | 33             | 73% | 0.9   |          |          |          |
|                | Spanish                   | 49       | 24% | - 3.8 | 85       | 44% | 4.4   | 12             | 27% | - 0.9 |          |          |          |
|                | Missing                   | 0        | 0%  |       | 0        | 0%  |       |                | 0%  |       |          |          |          |
| Marital Status |                           |          |     |       |          |     |       |                |     |       | 0.16     | .92      | 0.02     |
|                | Single                    | 110      | 53% | 0.4   | 99       | 51% | -0.3  | 23             | 51% | -0.1  |          |          |          |
|                | Partnered                 | 97       | 47% | -0.4  | 94       | 49% | 0.3   | 22             | 49% | 0.1   |          |          |          |
|                | Missing                   | 0        | 0%  |       |          | 0%  |       |                | 0%  |       |          |          |          |

*Note:* Significant differences ( $p < .05$ ) are indicated in bold. Res = Adjusted Residuals

<sup>a</sup> Cases with “Other” identified as race were excluded from the analysis because cells in contingency table were  $< 5$ .

Table 1 (Continued)

*Sociodemographic Characteristics of Included and Excluded Patients*

| Variable          |                               | Included<br>N = 207 |     | Excluded |     |     |                |    |     | $\chi^2$ | $p$  | $V$ |     |
|-------------------|-------------------------------|---------------------|-----|----------|-----|-----|----------------|----|-----|----------|------|-----|-----|
|                   |                               |                     |     | Time     |     |     | Incomplete PHQ |    |     |          |      |     |     |
|                   |                               |                     |     | n = 193  |     |     | n = 45         |    |     |          |      |     |     |
|                   |                               | n                   | %   | Res.     | n   | %   | Res.           | n  | %   | Res.     |      |     |     |
| Insurance Status  |                               |                     |     |          |     |     |                |    |     |          | 3.16 | .53 | .06 |
|                   | Not insured                   | 100                 | 48% | 0.4      | 95  | 49% | 0.7            | 16 | 36% | -1.7     |      |     |     |
|                   | Private                       | 33                  | 16% | 0.2      | 27  | 14% | -0.8           | 9  | 20% | 0.9      |      |     |     |
|                   | Public                        | 74                  | 36% | -0.5     | 71  | 37% | -0.1           | 20 | 44% | 1.1      |      |     |     |
|                   | Missing                       | 0                   | 0%  |          |     | 0%  |                |    | 0%  |          |      |     |     |
| Employment Status |                               |                     |     |          |     |     |                |    |     |          | 9.6  | .14 | .10 |
|                   | Unemployed                    | 118                 | 57% | 0.9      | 106 | 55% | 0.0            | 20 | 44% | -1.5     |      |     |     |
|                   | Employed                      | 62                  | 30% | 0.4      | 56  | 29% | 0.0            | 11 | 24% | -0.7     |      |     |     |
|                   | Homemaker                     | 9                   | 4%  | -1.1     | 12  | 6%  | 0.5            | 4  | 9%  | 1.0      |      |     |     |
|                   | Retired                       | 18                  | 9%  | -1.2     | 19  | 10% | -0.4           | 10 | 22% | 2.7      |      |     |     |
| Education         |                               |                     |     |          |     |     |                |    |     |          | 6.25 | .18 | .10 |
|                   | High School education or less | 52                  | 25% | -1.4     | 58  | 30% | 1.3            | 13 | 29% | 0.2      |      |     |     |
|                   | High School Graduate or GED   | 87                  | 42% | 2.0      | 59  | 31% | -2.3           | 18 | 40% | 0.5      |      |     |     |
|                   | College graduate              | 26                  | 13% | -0.8     | 31  | 16% | 1.4            | 4  | 9%  | -1.0     |      |     |     |
|                   | Missing                       | 42                  | 20% |          | 45  | 23% |                | 10 | 22% |          |      |     |     |

*Note:* Significant differences ( $p < .05$ ) are indicated in bold. Res = Adjusted Residuals

<sup>a</sup> Cases with “Other” identified as race were excluded from the analysis because cells in contingency table were  $< 5$ .

Table 1 (Continued)

*Sociodemographic Characteristics of Included and Excluded Patients*

| Variable                         | Included           |     |      | Excluded |     |      |                |    |      | $\chi^2$ | $p$  | $V$ |     |
|----------------------------------|--------------------|-----|------|----------|-----|------|----------------|----|------|----------|------|-----|-----|
|                                  | N = 207            |     |      | Time     |     |      | Incomplete PHQ |    |      |          |      |     |     |
|                                  | n                  | %   | Res. | n        | %   | Res. | n              | %  | Res. |          |      |     |     |
| Reported Annual Household Income |                    |     |      |          |     |      |                |    |      | 7.77     | .80  | .11 |     |
|                                  | <10,000            | 31  | 15%  | -0.9     | 36  | 19%  | 1.2            | 7  | 16%  | -0.4     |      |     |     |
|                                  | 10,000 to 29,999   | 80  | 39%  | 0.4      | 68  | 35%  | -0.7           | 19 | 42%  | 0.5      |      |     |     |
|                                  | 30,000 to 49,999   | 22  | 11%  | -1.0     | 24  | 12%  | 0.3            | 8  | 18%  | 1.1      |      |     |     |
|                                  | 50,000 to 69,999   | 10  | 5%   | 0.5      | 8   | 4%   | 0.0            | 1  | 2%   | -0.8     |      |     |     |
|                                  | 70,000- to 99,999  | 8   | 4%   | 0.8      | 5   | 3%   | -0.5           | 1  | 2%   | -0.4     |      |     |     |
|                                  | 100,000 to 149,999 | 6   | 3%   | 0.9      | 4   | 2%   | -0.2           | 0  | 0%   | -1.1     |      |     |     |
|                                  | 150,000 or more    | 2   | 1%   | 1.5      | 0   | 0%   | -1.2           | 0  | 0%   | -0.5     |      |     |     |
|                                  | Missing            | 48  | 23%  |          | 48  | 25%  |                | 9  | 20%  |          |      |     |     |
| Reported Cancer History          |                    |     |      |          |     |      |                |    |      |          | 1.52 | .47 | .06 |
|                                  | No                 | 83  | 40%  | 0.2      | 79  | 41%  | 0.5            | 14 | 31%  | -1.2     |      |     |     |
|                                  | Yes                | 124 | 60%  | -0.2     | 114 | 59%  | -0.5           | 31 | 69%  | 1.2      |      |     |     |
| Reported Mental Health History   |                    |     |      |          |     |      |                |    |      |          | 3.6  | .17 | .10 |
|                                  | No                 | 25  | 12%  | -1.1     | 24  | 12%  | 0.2            | 8  | 18%  | 1.8      |      |     |     |
|                                  | Yes                | 150 | 72%  | 1.1      | 118 | 61%  | -0.2           | 20 | 44%  | -1.8     |      |     |     |
|                                  | Missing            | 32  | 15%  |          | 51  | 26%  |                | 17 | 38%  |          |      |     |     |

*Note:* Significant differences ( $p < .05$ ) are indicated in bold. Res = Adjusted Residuals

<sup>a</sup> Cases with “Other” identified as race were excluded from the analysis because cells in contingency table were < 5.

Table 2

*Baseline Characteristics of Included and Excluded Patients*

| Variable             | Included<br>N = 207 |       | Time<br>n = 193 |       | Excluded<br>Incomplete PHQ<br>n = 45 |       | <i>F</i>    | <i>p</i>   | $\eta^2$    |
|----------------------|---------------------|-------|-----------------|-------|--------------------------------------|-------|-------------|------------|-------------|
|                      | M                   | SD    | M               | SD    | M                                    | SD    |             |            |             |
| Age                  | 50.00               | 10.98 | 50.54           | 11.54 | 50.44                                | 12.19 | 0.12        | .89        | .001        |
| Baseline PHQ-9 Score | 14.72               | 4.97  | 14.50           | 5.22  | 12.49                                | 4.71  | <b>3.66</b> | <b>.03</b> | <b>.016</b> |

*Note:* Significant differences ( $p < .05$ ) are indicated in bold.

Table 3

*Patient Characteristics by Outcome for Engagement in Multiple MHN Calls*

| Variable                                  | All Participants<br>N = 207 |     | Number of MHN Calls |     |                     |     |
|-------------------------------------------|-----------------------------|-----|---------------------|-----|---------------------|-----|
|                                           | n                           | %   | Single<br>n = 82    | %   | Multiple<br>n = 125 | %   |
| Sex                                       |                             |     |                     |     |                     |     |
| Male                                      | 25                          | 12% | 13                  | 16% | 12                  | 10% |
| Female                                    | 182                         | 88% | 69                  | 84% | 113                 | 90% |
| Race                                      |                             |     |                     |     |                     |     |
| Non-Hispanic White                        | 70                          | 34% | 28                  | 34% | 42                  | 34% |
| Black or African American                 | 53                          | 26% | 19                  | 23% | 34                  | 27% |
| Hispanic White                            | 80                          | 39% | 34                  | 42% | 46                  | 37% |
| Other                                     | 4                           | 2%  | 1                   | 1%  | 3                   | 2%  |
| Insurance Status                          |                             |     |                     |     |                     |     |
| Not insured                               | 100                         | 48% | 37                  | 45% | 63                  | 50% |
| Private                                   | 33                          | 16% | 15                  | 18% | 18                  | 14% |
| Public                                    | 74                          | 36% | 30                  | 37% | 44                  | 35% |
| Marital Status                            |                             |     |                     |     |                     |     |
| Single                                    | 110                         | 53% | 41                  | 50% | 69                  | 55% |
| Partnered                                 | 97                          | 47% | 41                  | 50% | 56                  | 45% |
| Employment Status                         |                             |     |                     |     |                     |     |
| Unemployed                                | 118                         | 57% | 37                  | 45% | 81                  | 65% |
| Employed                                  | 62                          | 30% | 33                  | 40% | 29                  | 23% |
| Homemaker                                 | 9                           | 4%  | 4                   | 5%  | 5                   | 4%  |
| Retired                                   | 18                          | 9%  | 8                   | 10% | 10                  | 8%  |
| Language                                  |                             |     |                     |     |                     |     |
| English                                   | 158                         | 76% | 63                  | 77% | 95                  | 76% |
| Spanish                                   | 49                          | 24% | 19                  | 23% | 30                  | 24% |
| Reported Cancer History                   |                             |     |                     |     |                     |     |
| No                                        | 83                          | 40% | 36                  | 44% | 47                  | 38% |
| Yes                                       | 124                         | 60% | 46                  | 56% | 78                  | 62% |
| Engagement in any Mental Health Treatment |                             |     |                     | 0%  |                     | 0%  |
| No                                        | 76                          | 37% | 44                  | 54% | 32                  | 26% |
| Yes                                       | 131                         | 63% | 38                  | 46% | 93                  | 74% |
| Received MCI Psych services               |                             |     |                     |     |                     |     |
| No                                        | 155                         | 75% | 69                  | 84% | 86                  | 69% |
| Yes                                       | 52                          | 25% | 13                  | 16% | 39                  | 31% |
| Baseline Presence of Suicidal Ideation    |                             |     |                     |     |                     |     |
| No                                        | 162                         | 78% | 66                  | 80% | 96                  | 77% |
| Yes                                       | 45                          | 22% | 16                  | 20% | 29                  | 23% |

Table 3 (Continued)

*Patient Characteristics by Outcome for Engagement in Multiple MHN Calls*

| Variable             | All Participants |       | Number of MHN Calls |       |          |       |
|----------------------|------------------|-------|---------------------|-------|----------|-------|
|                      | N = 207          |       | Single              |       | Multiple |       |
|                      | M                | SD    | M                   | SD    | M        | SD    |
| Age                  | 50               | 10.98 | 49.01               | 11.91 | 50.64    | 10.31 |
| Baseline PHQ-9 Score | 14.72            | 4.97  | 14.12               | 4.87  | 15.11    | 5.01  |

Table 4

*Retained Baseline Predictors of Engagement in Multiple MHN Calls*

| Variable  | $\beta$ | Odds Ratio |
|-----------|---------|------------|
| Intercept | 0.50    | N/A        |
| Employed  | -0.25   | 0.78       |

*Note:* The following candidate predictors were not retained by the lasso: age, sex, language, black race, Hispanic white, other race, privately insured, publicly insured, partnered marital status, homemaker, retired, reported cancer history, baseline presence of suicidal ideation, and baseline depression severity.

Table 5

*Measures of Model Accuracy*

| Model                           | N   | $\lambda$ | Min  | Max  | Accuracy | 95% CI       | NIR  | AUC  | CI           | $\kappa$ | BS   |
|---------------------------------|-----|-----------|------|------|----------|--------------|------|------|--------------|----------|------|
| Multiple MHN Calls <sup>a</sup> | 207 | 0.06      | 0.56 | 0.62 | 0.6      | [0.53, 0.67] | 0.6  | 0.59 | [0.52, 0.65] | 0        | 0.24 |
| Remission <sup>b</sup>          | 125 | 0.04      | 0.04 | 0.49 | 0.81     | [0.73, 0.87] | 0.81 | 0.79 | [0.70, 0.89] | 0        | 0.13 |
| Reduction <sup>b</sup>          | 125 | 0.04      | 0.16 | 0.64 | 0.67*    | [0.58, 0.75] | 0.59 | 0.73 | [0.65, 0.82] | 0.27     | 0.21 |

*Note.* CI = DeLong's confidence interval; NIR = no-information rate; AUC = Area Under the ROC Curve; BS = Brier score; Min = minimum predicted probability; Max = maximum predicted probability.

<sup>a</sup>A set of 15 baseline candidate predictors were entered. See Table 1 for data related to the retained predictors.

<sup>b</sup>A set of 20 candidate predictors were entered, 15 of which were also candidate predictors in the Multiple MHN Calls model.

\* $p < .05$

Table 6

*Patient Characteristics by Remission and Clinically Significant Reduction in Depression Symptoms*

| Variable                  | All Patients<br>n = 125 |     | Hypothesis II           |     |                     |     | Hypothesis IIa   |     |               |     |
|---------------------------|-------------------------|-----|-------------------------|-----|---------------------|-----|------------------|-----|---------------|-----|
|                           |                         |     | No Remission<br>n = 101 |     | Remission<br>n = 24 |     | No CSR<br>n = 74 |     | CSR<br>n = 51 |     |
|                           | n                       | %   | n                       | %   | n                   | %   | n                | %   | n             | %   |
| Sex                       |                         |     |                         |     |                     |     |                  |     |               |     |
| Male                      | 12                      | 10% | 11                      | 11% | 1                   | 4%  | 7                | 9%  | 5             | 10% |
| Female                    | 113                     | 90% | 90                      | 89% | 23                  | 96% | 67               | 91% | 46            | 90% |
| Race                      |                         |     |                         |     |                     |     |                  |     |               |     |
| Non-Hispanic White        | 42                      | 34% | 36                      | 36% | 6                   | 25% | 29               | 39% | 13            | 26% |
| Black or African American | 34                      | 27% | 31                      | 31% | 3                   | 13% | 22               | 30% | 12            | 24% |
| Hispanic White            | 46                      | 37% | 31                      | 31% | 15                  | 63% | 20               | 27% | 26            | 51% |
| Other                     | 3                       | 2%  | 3                       | 3%  | 0                   | 0%  | 3                | 4%  | 0             | 0%  |
| Insurance Status          |                         |     |                         |     |                     |     |                  |     |               |     |
| Not insured               | 63                      | 50% | 44                      | 44% | 19                  | 79% | 33               | 45% | 30            | 59% |
| Private                   | 18                      | 14% | 16                      | 16% | 2                   | 8%  | 9                | 12% | 9             | 18% |
| Public                    | 44                      | 35% | 41                      | 41% | 3                   | 13% | 32               | 43% | 12            | 24% |
| Marital Status            |                         |     |                         |     |                     |     |                  |     |               |     |
| Single                    | 69                      | 55% | 59                      | 58% | 10                  | 42% | 48               | 65% | 21            | 41% |
| Partnered                 | 56                      | 45% | 42                      | 42% | 14                  | 58% | 26               | 35% | 30            | 59% |

*Note.* The overall sample of 125 patients is the same sample for hypothesis II and IIa. Data is separated by whether or not the patient achieved remission or a clinically significant reduction.

Table 6 (Continued)

*Patient Characteristics by Remission and Clinically Significant Reduction in Depression Symptoms*

| Variable                                  | Hypothesis II           |     |                         |     |                     |     | Hypothesis IIa   |     |               |     |
|-------------------------------------------|-------------------------|-----|-------------------------|-----|---------------------|-----|------------------|-----|---------------|-----|
|                                           | All Patients<br>n = 125 |     | No Remission<br>n = 101 |     | Remission<br>n = 24 |     | No CSR<br>n = 74 |     | CSR<br>n = 51 |     |
|                                           | n                       | %   | n                       | %   | n                   | %   | n                | %   | n             | %   |
| Employment Status                         |                         |     |                         |     |                     |     |                  |     |               |     |
| Unemployed                                | 81                      | 65% | 67                      | 66% | 14                  | 58% | 45               | 61% | 36            | 71% |
| Employed                                  | 29                      | 23% | 24                      | 24% | 5                   | 21% | 20               | 27% | 9             | 18% |
| Homemaker                                 | 5                       | 4%  | 2                       | 2%  | 3                   | 13% | 2                | 3%  | 3             | 6%  |
| Retired                                   | 10                      | 8%  | 8                       | 8%  | 2                   | 8%  | 7                | 9%  | 3             | 6%  |
| Language                                  |                         |     |                         |     |                     |     |                  |     |               |     |
| English                                   | 95                      | 76% | 82                      | 81% | 13                  | 54% | 62               | 84% | 33            | 65% |
| Spanish                                   | 30                      | 24% | 19                      | 19% | 11                  | 46% | 12               | 16% | 18            | 35% |
| Reported Cancer History                   |                         |     |                         |     |                     |     |                  |     |               |     |
| No                                        | 47                      | 38% | 33                      | 33% | 14                  | 58% | 25               | 34% | 22            | 43% |
| Yes                                       | 78                      | 62% | 68                      | 67% | 10                  | 42% | 49               | 66% | 29            | 57% |
| Engagement in any Mental Health Treatment |                         |     |                         |     |                     |     |                  |     |               |     |
| No                                        | 32                      | 26% | 23                      | 23% | 9                   | 38% | 16               | 22% | 16            | 31% |
| Yes                                       | 93                      | 74% | 78                      | 77% | 15                  | 63% | 58               | 78% | 35            | 69% |
| Received MCI Psych services               |                         | 0%  |                         |     |                     |     |                  |     |               |     |
| No                                        | 86                      | 69% | 68                      | 67% | 18                  | 75% | 49               | 66% | 37            | 73% |
| Yes                                       | 39                      | 31% | 33                      | 33% | 6                   | 25% | 25               | 34% | 14            | 27% |
| Baseline Presence of Suicidal Ideation    |                         |     |                         |     |                     |     |                  |     |               |     |
| No                                        | 96                      | 77% | 74                      | 73% | 22                  | 92% | 55               | 74% | 41            | 80% |
| Yes                                       | 29                      | 23% | 27                      | 27% | 2                   | 8%  | 19               | 26% | 10            | 20% |

*Note.* The overall sample of 125 patients is the same sample for hypothesis II and IIa. Data is separated by whether or not the patient achieved remission or a clinically significant reduction.

Table 6 (Continued)

*Patient Characteristics by Remission and Clinically Significant Reduction in Depression Symptoms*

| Variable                           | Hypothesis II           |                         |                       | Hypothesis IIa       |               |
|------------------------------------|-------------------------|-------------------------|-----------------------|----------------------|---------------|
|                                    | All Patients<br>n = 125 | No Remission<br>n = 101 | Remission<br>n = 24   | No CSR<br>n = 74     | CSR<br>n = 51 |
|                                    | M ± SD                  | M ± SD                  | M ± SD                | M ± SD               | M ± SD        |
| Age                                | 50.64 ± 10.31           | 50.55 ± 9.87            | 51 ± 12.22            | 50.95 ± 9.45         | 50.2 ± 11.54  |
| Baseline PHQ-9 Score               | 15.11 ± 5.01            | 15.4 ± 4.87             | 13.92 ± 5.52          | 15.2 ± 4.92          | 14.98 ± 5.2   |
| Variable                           | Median [IQR]            | Median [IQR]            | Median [IQR]          | Median [IQR]         | Median [IQR]  |
| Number of MHN Calls                | 3 [2, 4.5]              | 3 [2, 5]                | 2.5 [2, 3]            | 3 [2, 5]             | 3 [2, 4]      |
| Mean Elapsed Time<br>Between Calls | 39 [25, 74.5]           | 32 [21, 51]             | 40.5 [29, 100.5]      | 33.5 [21, 48.50]     | 35 [24, 66]   |
| Duration of MHN                    | 109 [56.5, 243]         | 114 [49, 265.5]         | 104.5 [63.75, 164.75] | 112.5 [60.5, 290.25] | 105 [48, 216] |

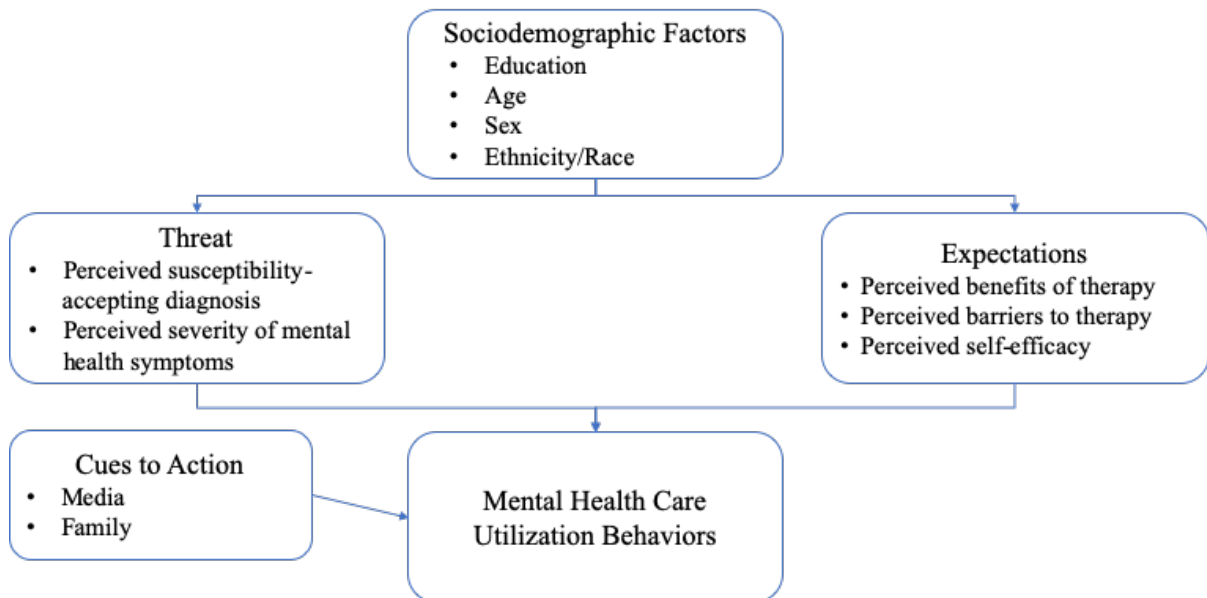
*Note.* The overall sample of 125 patients is the same sample for hypothesis II and IIa. Data is separated by whether or not the patient achieved remission or a clinically significant reduction.

Table 7

*Retained Predictors of Achieving Depression Remission and a Clinically Significant Reduction in Depressive Symptoms*

| Variable                        | Remission |            | Clinically Significant Reduction |            |
|---------------------------------|-----------|------------|----------------------------------|------------|
|                                 | $\beta$   | Odds Ratio | $\beta$                          | Odds Ratio |
| Intercept                       | - 1.09    |            | - 0.29                           |            |
| Sociodemographic                |           |            |                                  |            |
| Language (Spanish)              | 0.35      | 1.42       | 0.24                             | 1.27       |
| Race/Ethnicity (Hispanic white) | 0.34      | 1.40       | 0.30                             | 1.35       |
| Race (Other)                    | -         | -          | - 0.46                           | 0.63       |
| Marital Status (Partnered)      | -         | -          | 0.45                             | 1.57       |
| Employment (Homemaker)          | 0.59      | 1.80       | -                                | -          |
| Employment (Out of home)        | -         | -          | - 0.41                           | 0.66       |
| Insurance (Public)              | - 0.43    | 0.65       | - 0.37                           | 0.69       |
| Mental Health or Medical        |           |            |                                  |            |
| Baseline Suicidal Ideation      | - 0.43    | 0.65       | -                                | -          |
| MHN                             |           |            |                                  |            |
| Number of MHN Calls             | - 0.12    | 0.89       | - 0.07                           | 0.93       |

Note. Cells with a – indicate that the variable was not retained by the lasso in the respective model. Both models contained the same 20 candidate predictors.



*Figure 1.* Health Belief Model Diagram by Henshaw & Freedman-Doan (2009) who adapted the original Health Belief Model (Rosenstock et al., 1990) for Mental Health Care Utilization.

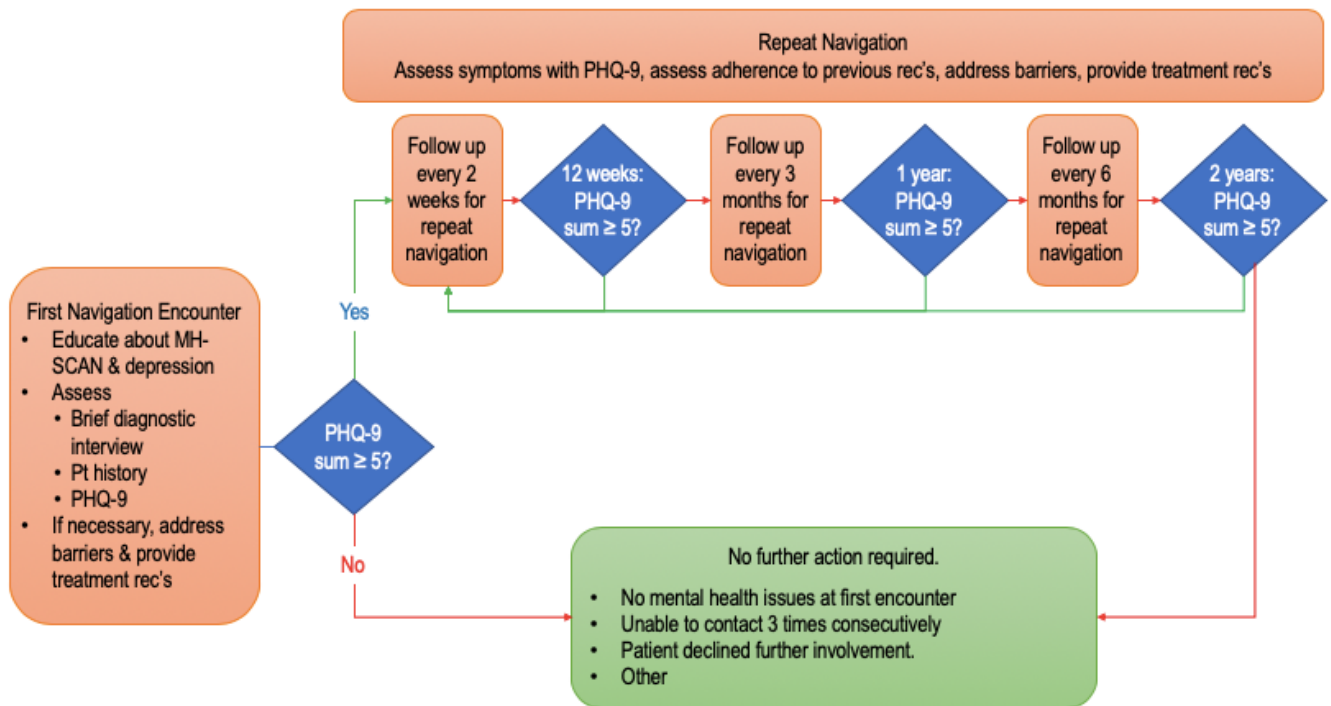
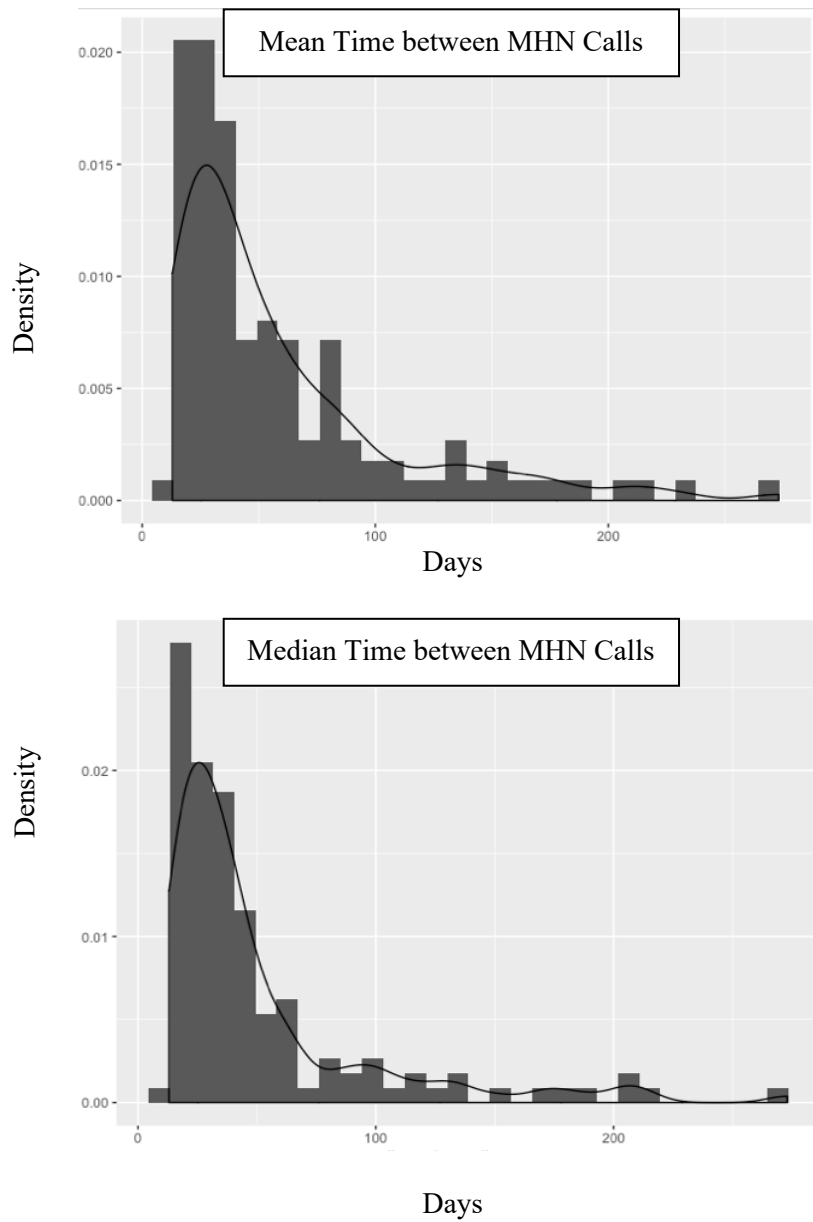


Figure 2. Mental Health Navigation Diagram



*Figure 3.* Histograms Illustrating the Distribution of the Mean and Median Elapsed Time, in Days, between MHN calls. These histograms show the positive skew and leptokurtic structure of the mean and median elapsed days between MHN calls.

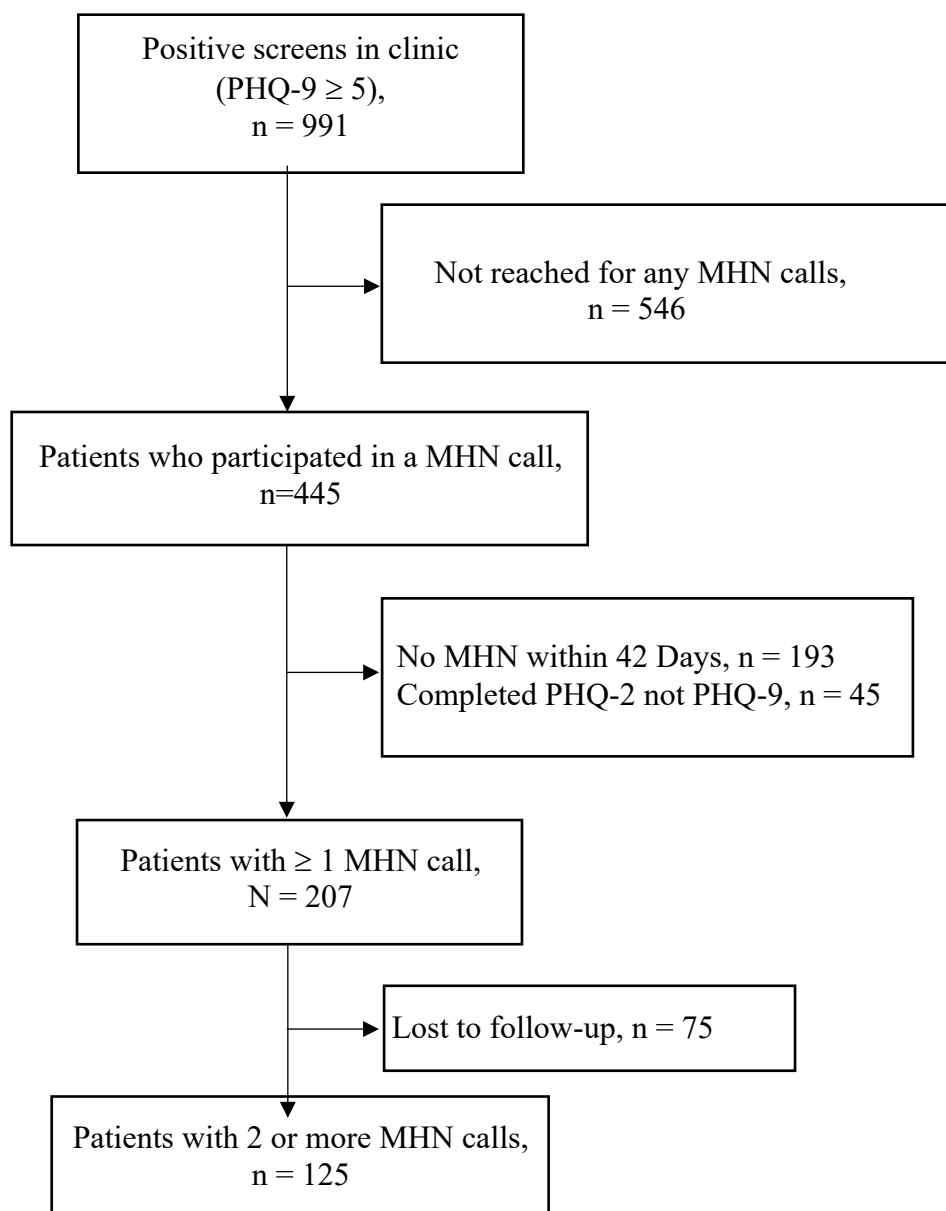
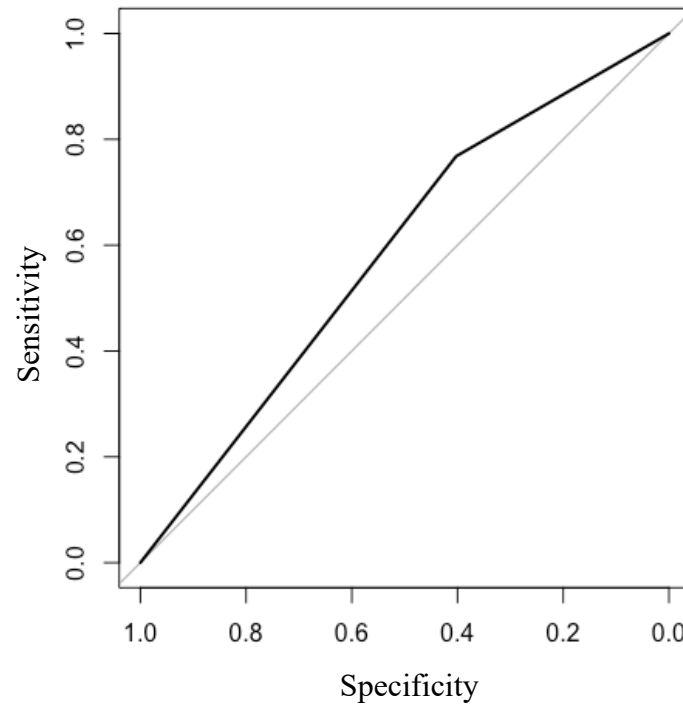
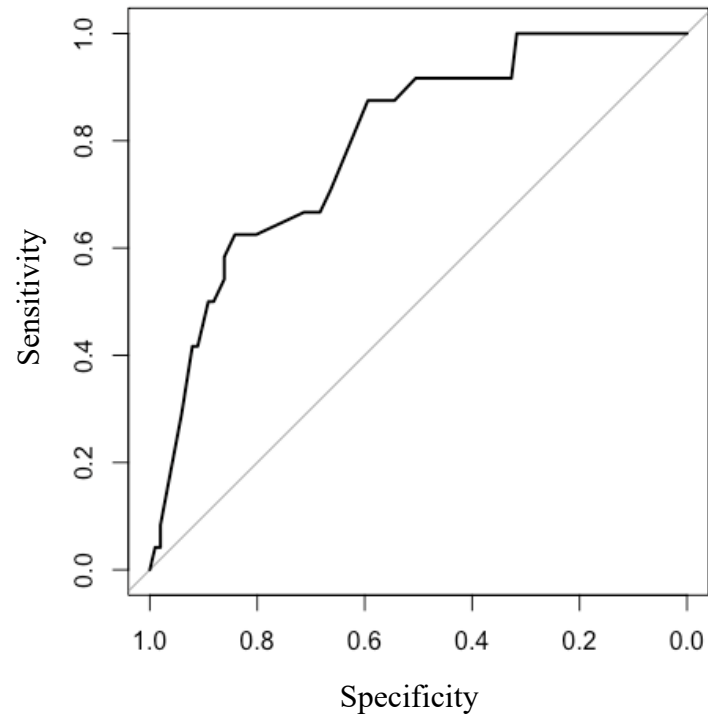


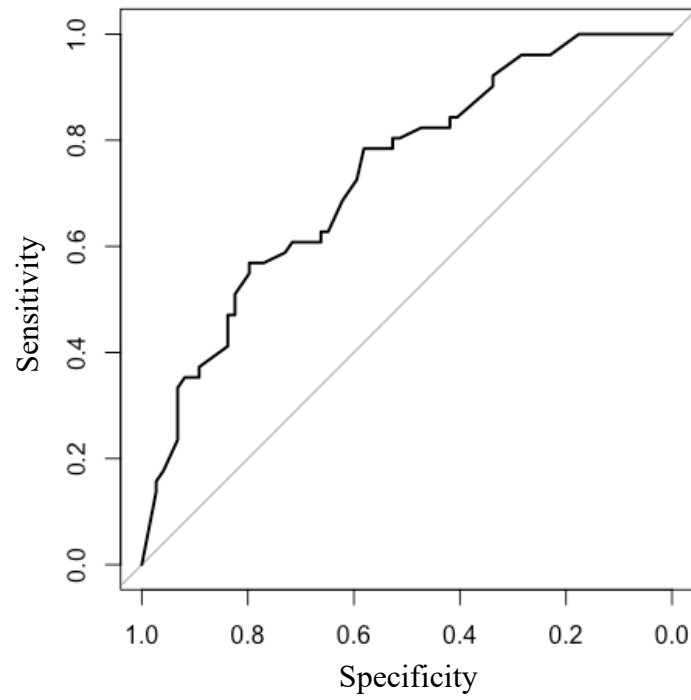
Figure 4. Consort Diagram



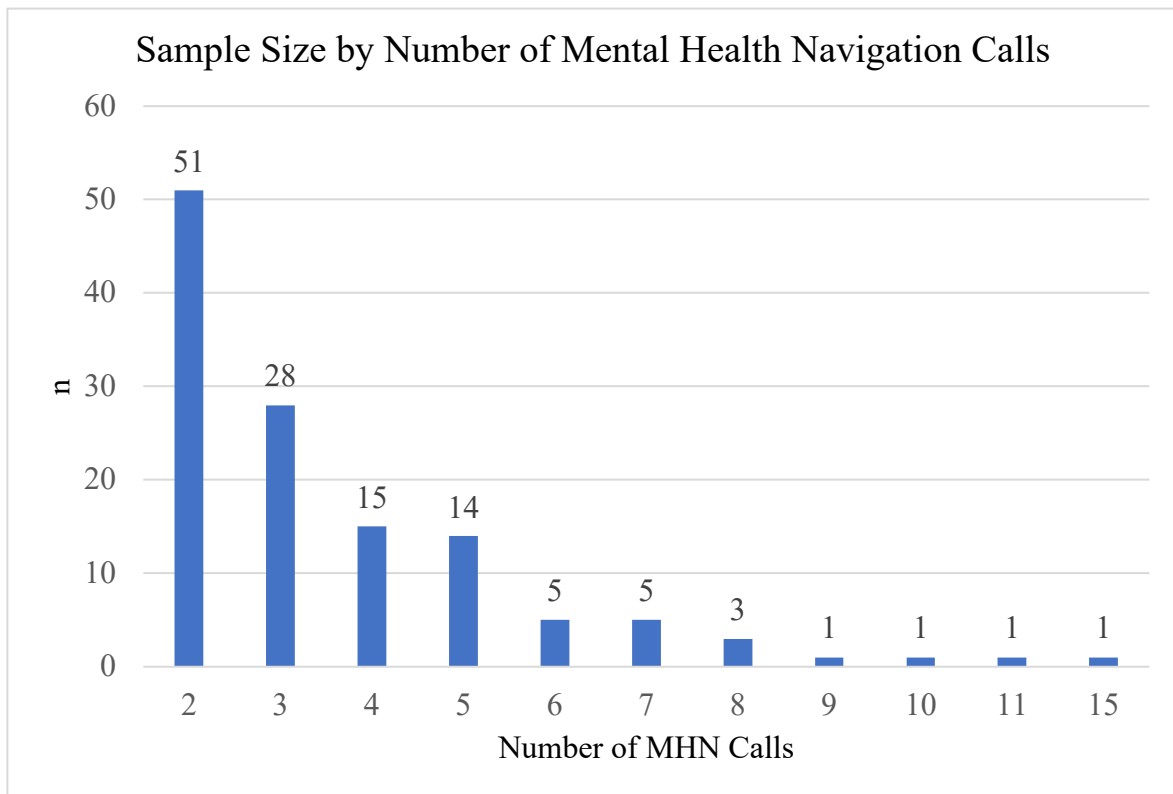
*Figure 5.* Receiver Operating Characteristic (ROC) Curve for the Model Predicting Engagement in Multiple MHN Calls



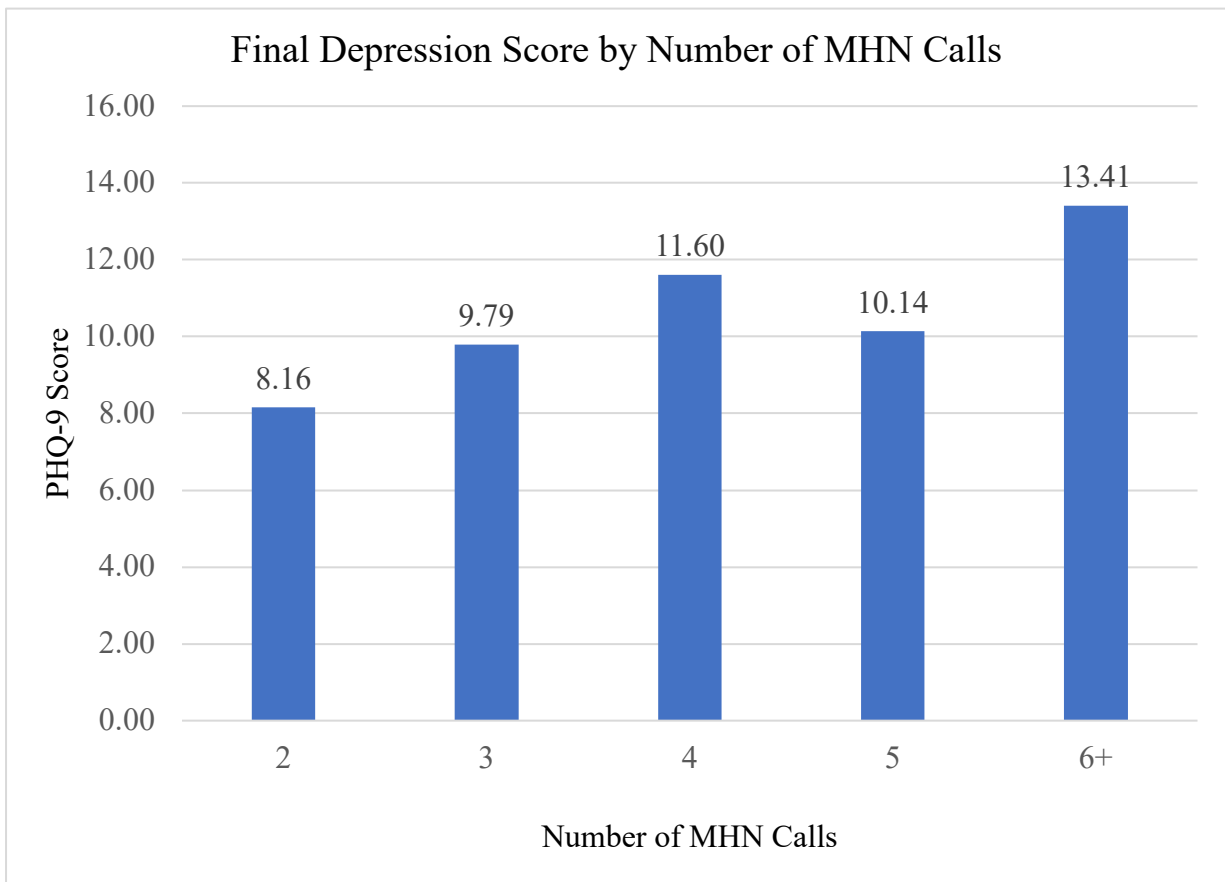
*Figure 6.* Receiver Operating Characteristic (ROC) Curve for the Model Predicting Achievement of Depression Remission



*Figure 7.* Receiver Operating Characteristic (ROC) Curve for the Model Predicting Achievement of Clinically Significant Depression Reduction



*Figure 8.* The Sample Size for Number of Mental Health Navigation Calls Reduces Dramatically After Five Calls.



*Figure 9.* Average Final Depression Score Generally Increases with a Higher Number of MHN Calls. Patient data for those with 6 or more calls were combined due to low sample size.

## APPENDIX A

### Variable List

| Name                        | Description                             | Scale; Levels                                                                                                                                                                                         | Data Source | Where to find it                                                                                                                                                                             |
|-----------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Age                         | Age (in years) at first PHQ-9 screening | Ratio<br>18-100                                                                                                                                                                                       | VS6         | <ul style="list-style-type: none"> <li>Calculated by VS6</li> </ul>                                                                                                                          |
| Sex                         | Biological sex                          | Nominal<br>0= Male<br>1= Female                                                                                                                                                                       | Chart       | <ul style="list-style-type: none"> <li>Note from MHN</li> <li>Media&gt; Health Questionnaire/Pearlman Mayo Survey</li> <li>Patient Select</li> </ul>                                         |
| Race                        |                                         | Nominal<br>1= American Indian or Alaskan Native<br>2= Asian<br>3= Black or African American<br>4= Native Hawaiian or Other Pacific Islander<br>6= White<br>7= Biracial or Multiracial<br>999= Missing | Chart       | <ul style="list-style-type: none"> <li>Note from MHN</li> <li>Media&gt;DSRIP Enrollment Form</li> <li>Media&gt; Health Questionnaire/Pearlman Mayo Survey</li> <li>Patient Select</li> </ul> |
| Ethnicity                   | Hispanic origin                         | Nominal<br>0= Non-Hispanic<br>1= Hispanic<br>999= Missing                                                                                                                                             | Chart       | <ul style="list-style-type: none"> <li>Note from MHN</li> <li>Media&gt;DSRIP Enrollment Form</li> <li>Media&gt; Health Questionnaire/Pearlman Mayo Survey</li> <li>Patient Select</li> </ul> |
| Language                    |                                         | Nominal<br>0= English<br>1= Spanish<br>2= Other<br>999= Missing                                                                                                                                       | VS6         | <ul style="list-style-type: none"> <li>Media&gt;DSRIP Enrollment Form</li> <li>VS6 language</li> <li></li> </ul>                                                                             |
| Zip code                    |                                         |                                                                                                                                                                                                       | Chart       | <ul style="list-style-type: none"> <li>Patient Select</li> </ul>                                                                                                                             |
| Annual Income (categorical) |                                         | Ordinal<br>1= < 10,000<br>2= 10000 to 29999<br>3= 30000 to 49999<br>4= 50000 to 69999<br>5= 70000 to 99999<br>6= 100000 to 149999<br>7= 15000 or more<br>999 Missing                                  | Chart       | <ul style="list-style-type: none"> <li>Note from MHN, Cancer Survivorship</li> <li>Note from Outreach &gt; Flowsheet &gt; Federal Poverty Level</li> </ul>                                   |
| % Federal Poverty Level     |                                         | Ratio<br>0-1000<br>999= Missing                                                                                                                                                                       | Chart       | <ul style="list-style-type: none"> <li>Note from Cancer Survivorship</li> <li>Note from Outreach &gt; Flowsheet &gt;</li> </ul>                                                              |

|                   |                                  |                                                                                                                                                                                                                                                                                                                                                            |                 |                                                                                                                                                                                                                                     |
|-------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |                                  |                                                                                                                                                                                                                                                                                                                                                            |                 | Federal Poverty Level                                                                                                                                                                                                               |
| Employment Status |                                  | 1= Employed<br>2= Unemployed/ Unable to work<br>3= Retired<br>4= On Disability<br>999= Missing                                                                                                                                                                                                                                                             |                 | <ul style="list-style-type: none"> <li>Note from MHN, Psychology, cancer survivorship</li> <li>Media&gt; Health Questionnaire/Pearlman Mayo Survey</li> <li>Note from Outreach &gt; Flowsheet &gt; Federal Poverty Level</li> </ul> |
| Education         |                                  | 0= Never attended school or only attended kindergarten<br>1= Grades 1-9 (Elementary/Middle school)<br>2= Grades 10-11 (Some High School)<br>3= Grades 12 or GED (High School Graduate)<br>4= College 1 year to 3 years (Some college or technical school)<br>5= College 4 years (College graduate)<br>6= Graduate School (Advanced degree)<br>999= Missing |                 | <ul style="list-style-type: none"> <li>Note from MHN</li> </ul>                                                                                                                                                                     |
| Marital Status    |                                  | Nominal<br>0= Never Married<br>1= Married<br>2= Domestic Partner<br>3= Divorced<br>4= Widowed<br>5= Separated<br>999= Missing                                                                                                                                                                                                                              | Chart<br>Media> | <ul style="list-style-type: none"> <li>Note from MHN</li> <li>Media&gt;DSRIP Enrollment Form</li> <li>Media&gt; Health Questionnaire/Pearlman Mayo Survey</li> <li>Note from Cancer Survivorship</li> </ul>                         |
| Insurance status  |                                  | Nominal<br>0= Not insured<br>1= Insured<br>2= Social or government-sponsored (Medicaid/Medicare/JPS Connection)<br>999= Missing                                                                                                                                                                                                                            | Chart           | <ul style="list-style-type: none"> <li>Media&gt;DSRIP Enrollment Form</li> <li>Note from Cancer Survivorship</li> <li>Note from Outreach &gt; Flowsheet &gt; Federal Poverty Level</li> </ul>                                       |
| Cancer history    | Current or past cancer diagnosis | Nominal<br>0= No<br>1= Yes<br>999= Missing                                                                                                                                                                                                                                                                                                                 | Chart           | <ul style="list-style-type: none"> <li>Media&gt;DSRIP Enrollment Form</li> <li>Media&gt; Health Questionnaire/Pearlman Mayo Survey</li> </ul>                                                                                       |

|                                                                                                                                                                                                     |  |                                                                                                                                                                                                                                                                                                                                                                    |       |                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                     |  |                                                                                                                                                                                                                                                                                                                                                                    |       | <ul style="list-style-type: none"> <li>• Note from MHN, Psychology, cancer survivorship, Outreach</li> <li>• Note from other health provider</li> </ul>                                                                                                |
| Year of diagnosis                                                                                                                                                                                   |  | 0= ≤ 1 year<br>1= > 1 year<br>888= N/A<br>999= Missing                                                                                                                                                                                                                                                                                                             | Chart | <ul style="list-style-type: none"> <li>• Media&gt;DSRIP Enrollment Form</li> <li>• Media&gt; Health Questionnaire/Pearlman Mayo Survey</li> <li>• Note from MHN, Psychology, cancer survivorship</li> <li>• Note from other health provider</li> </ul> |
| Cancer site<br><br>[source:<br><a href="https://www.cancer.gov/types/by-body-location">https://www.cancer.gov/types/by-body-location</a> ]                                                          |  | Nominal<br>1= Aids-Related<br>2= Breast<br>3= Digestive/Gastrointestinal<br>4= Endocrine and Neuroendocrine<br>5= Eye<br>6= Genitourinary<br>7= Germ Cell<br>8= Gynecological<br>9= Head and Neck<br>10= Hematological/Blood<br>11= Musculoskeletal<br>12= Neurological<br>13= Respiratory/Thoracic<br>14= Skin<br>15= Unknown Primary<br>888= N/A<br>999= Missing | Chart | <ul style="list-style-type: none"> <li>• Media&gt;DSRIP Enrollment Form</li> <li>• Media&gt; Health Questionnaire/Pearlman Mayo Survey</li> <li>• Note from MHN, Psychology, cancer survivorship</li> <li>• Note from other health provider</li> </ul> |
| Cancer Histology<br><br>[Source:<br><a href="https://training.seer.cancer.gov/disease/categories/classification.html">https://training.seer.cancer.gov/disease/categories/classification.html</a> ] |  | 1= Carcinoma<br>2= Sarcoma<br>3= Myeloma<br>4= Leukemia<br>5= Lymphoma<br>6= Mixed Types<br>888= N/A<br>999= Missing                                                                                                                                                                                                                                               |       | <ul style="list-style-type: none"> <li>• Media&gt;DSRIP Enrollment Form</li> <li>• Media&gt; Health Questionnaire/Pearlman Mayo Survey</li> <li>• Note from MHN, Psychology, cancer survivorship</li> </ul>                                            |
| Cancer stage                                                                                                                                                                                        |  | Nominal<br>0= 0<br>1= 1<br>2= 2<br>3= 3                                                                                                                                                                                                                                                                                                                            | Chart | <ul style="list-style-type: none"> <li>• Note from MHN, Psychology, cancer survivorship</li> </ul>                                                                                                                                                     |

|                                               |                                                                                                     |                                                      |       |                                                                                                                              |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------|
|                                               |                                                                                                     | 4= 4<br>888= N/A<br>999= Missing                     |       |                                                                                                                              |
| Genetic Carrier (AKA Previvor)                |                                                                                                     | 0= No<br>1= Yes<br>999= Missing                      | Chart | <ul style="list-style-type: none"> <li>Genetic counseling note- positive result</li> </ul>                                   |
| Depression severity                           | Sum of PHQ-9 items 1-9                                                                              | Interval<br>0-27                                     | VS6   | <ul style="list-style-type: none"> <li>Calculated by VS6</li> </ul>                                                          |
| Presence of suicidal ideation                 | PHQ-9 question 9                                                                                    | Nominal;<br>0 = 0 on PHQ-9 #9<br>1 = 1-3 on PHQ-9 #9 | VS6   | <ul style="list-style-type: none"> <li>Calculated by VS6</li> </ul>                                                          |
| Engagement in any MH Treatment                | Engagement in psychopharmacological treatment, psychotherapy, support groups, behavioral activation | 0 = No<br>1 = Yes<br>999= Missing                    | Chart | <ul style="list-style-type: none"> <li>Note from MHN, Psychology, cancer survivorship</li> </ul>                             |
| Engagement in psychopharmacological treatment | Reported taking medication for a psychiatric condition                                              | 0 = No<br>1 = Yes<br>999= Missing                    | Chart | <ul style="list-style-type: none"> <li>Note from MHN</li> <li>Media&gt; Health Questionnaire/Pearlman Mayo Survey</li> </ul> |
| Engagement in psychotherapy                   | Reported attending at least 1 session of psychotherapy                                              | 0 = No<br>1 = Yes<br>999= Missing                    | Chart | <ul style="list-style-type: none"> <li>Note from MHN, Psychology, cancer survivorship</li> </ul>                             |
| Engagement in support group(s)                | Reported attending at least 1 support group                                                         | 0 = No<br>1 = Yes<br>999= Missing                    | Chart | <ul style="list-style-type: none"> <li>Note from MHN, Psychology, cancer survivorship</li> </ul>                             |
| Engagement in behavioral activation           | Reported completing a behavioral activation task OR attended exercise appointment(s) at MCI         | 0 = No<br>1 = Yes<br>999= Missing                    | Chart | <ul style="list-style-type: none"> <li>Note from MHN, Psychology, cancer survivorship</li> </ul>                             |
| Received Psychological Services at MCI        | At least 1 office visit with psychology provider at Moncrief                                        | 0= No<br>1= Yes<br>999= Missing                      | Chart | <ul style="list-style-type: none"> <li>Office visit with psychology provider</li> </ul>                                      |
| Sex of Navigator                              |                                                                                                     | Nominal<br>0= Male<br>1= Female                      | Chart | <ul style="list-style-type: none"> <li>Derived from VS6 Data</li> </ul>                                                      |
| Total Navigation Calls                        | Total number of MHN calls                                                                           | Ratio                                                | VS6   | <ul style="list-style-type: none"> <li>Calculated using data derived from VS6</li> </ul>                                     |
| Navigation frequency (average)                | Average number of days between MHN encounters                                                       | Ratio                                                | VS6   | <ul style="list-style-type: none"> <li>Calculated using data derived from VS6</li> </ul>                                     |
| Navigation frequency (std deviation)          | Standard deviation of number of days between MHN encounters                                         | Ratio                                                | VS6   | <ul style="list-style-type: none"> <li>Calculated using data derived from VS6</li> </ul>                                     |
| Total elapsed time in Navigation              | Date of last MHN call– date of baseline                                                             | Ratio                                                | VS6   | <ul style="list-style-type: none"> <li>Calculated using data derived from VS6</li> </ul>                                     |

|                                                         |                                                                                                                                          |                                |     |                                                                                          |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----|------------------------------------------------------------------------------------------|
| Engagement in multiple MHN calls                        | No= Completion of 1 MHN call<br>Yes = Completion of 2+ MHN calls                                                                         | Categorical<br>0= No<br>1= Yes | VS6 | <ul style="list-style-type: none"> <li>Calculated using data derived from VS6</li> </ul> |
| Depression remission                                    | PHQ-9 <5                                                                                                                                 | 0= No<br>1= Yes                | VS6 | <ul style="list-style-type: none"> <li>Calculated using data derived from VS6</li> </ul> |
| Clinically significant reduction in depression symptoms | (PHQ-9 sum at baseline – PHQ-9 sum on last navigation phone encounter) / PHQ-9 sum at baseline; evaluate if change is a reduction of 50% | 0= No<br>1= Yes                | VS6 | <ul style="list-style-type: none"> <li>Calculated using data derived from VS6</li> </ul> |