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THE ROLE OF PSYCHOLOGY IN INTEGRATED PRIMARY CARE
FOR COMPLEX PATIENTS: EFFECTS ON MENTAL HEALTH, UTILIZATION, AND
PHYSIOLOGICAL MARKERS OF HEALTH

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of
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Abstract

THE ROLE OF PSYCHOLOGY IN INTEGRATED PRIMARY CARE FOR COMPLEX PATIENTS: EFFECTS ON MENTAL HEALTH, UTILIZATION, AND PHYSIOLOGICAL MARKERS OF HEALTH

By Danielle Christina Worthington, Ph.D.

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

Virginia Commonwealth University, 2015.

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This study served as an initial evaluation of integrated psychology services within a clinic designed to serve uninsured patients with complex medical concerns and high utilization histories at the Medical College of Virginia in Richmond, Virginia. The current study evaluates patient outcomes, and more specifically, it further quantifies and describes the role that psychologists play in the primary care setting and their impact on utilization of medical care and in improved health outcomes. Additionally, the study evaluates psychologists' success at treating mental and behavioral health conditions within the primary care model. The present study demonstrates that patients with complex medical and mental health needs can be effectively managed and treated in an integrated ambulatory care clinic. Care within this clinic

resulted in significant improvements in depression, anxiety, HbA1c, cholesterol, and blood pressure. The findings suggested possible improvements in behavioral health outcomes such as insomnia as well, but more structured follow-up data are needed in future research to explore this relationship. Additionally it is possible that reductions in BMI may be significant if followed over a longer period of time. Utilization outcomes were more mixed, and contrary to the expectation that integrated services and improvements in health would be related to decreased utilization. Given the shift in health outcomes over the follow-up period, it is possible that early increases in utilization at the six-month mark, may shift to reductions in utilization and cost if the window of observation is expanded.

The Role of Psychology in Integrated Primary Care for Complex Patients:

Effects on Mental Health, Utilization of Medical Services, and Physiological Markers of Health

Patient-centered medical homes have been strongly supported as the future of medicine, and psychologists have been identified as essential components to a successful integrated medical team. Due to increasing utilization costs and sweeping policy changes, adaptations within the health care delivery system are a necessity. Multiple models and levels of integration have been introduced as a solution to the problems plaguing our healthcare system, however the real world applicability and scalability of these propositions remains a question particularly for patients who are utilizing medical resources at the highest level. These patients with complex medical conditions and multiple chronic diseases are a particularly difficult population to manage. Not only do they exhibit poor treatment adherence resulting in decreased health status and outcomes, but the related trips to the emergency room, inpatient hospital stays, and numerous specialty visits put financial pressure on the health care system which is unsustainable overtime.

Mental health issues and psychological factors have been determined to be predictors of this increase in utilization and medical care costs, necessitating the inclusion of psychologists into primary care medicine. Psychologists have specific expertise needed to fill an essential role within primary care. Problems commonly seen by primary care psychologists range from insomnia, chronic pain, depression, and anxiety to more severe mental illness. Incorporation of psychologists within primary care can be an effective way to treat depression and anxiety in an otherwise difficult to treat population. Treatment of depression and anxiety has initially been linked to improvements in health status and is hypothesized to be associated to reductions in utilization and, therefore, costs.

The following review of the literature will briefly describe primary care integration as well as barriers to the integration and inclusion of psychologists. Specifically, difficulties managing complex patient populations with high prevalence rates of chronic illness will be discussed. In addition, factors related to high rates of utilization will be reviewed, as well as the specific role of mental health problems as they relate to utilization of medical care services. Finally, the role of the psychologist in primary care, the common problems and treatments implemented by primary care psychologists, and the effects of these treatments on health status will be reviewed.

The study evaluates patient outcomes within an integrated primary care clinic designed to manage a complex patient population. More specifically, the current study seeks to further quantify and describe the specific role psychologists play in the primary care setting and their unique impact on reductions in utilization of medical care and in improved health outcomes. Additionally, the study will evaluate psychologists' success at treating mental and behavioral health conditions within the primary care model. It is hypothesized that in addition to being an effective delivery system for treatment of mental and behavioral health problems, the interventions provided by psychology in this setting will also contribute to the reduction in utilization of medical care and related expenditures through improvements in mental and physical health status and outcomes.

Review of the Literature

Medical Care Utilization and Associated Costs

Healthcare expenditures in the United States continue to rise, and although this is not a new area of discussion, it continues to instigate growing concern among patients, policy makers, and providers alike (Fries et al., 1993). In 2010, healthcare costs in the United States reached a

stunning total of 2.6 trillion dollars (Centers for Medicare and Medicaid Services, 2012). This is an increase from 1.9 trillion dollars in just 2004, when 16% of the gross domestic product (GDP) was spent on healthcare costs, as compared to 255 billion dollars and 9% of the GDP in 1980 (Agency for Healthcare Research and Quality (AHRQ), 2006). This equates to a per person increase in medical expenses from an average of about 1,106 dollars to 6,280 dollars for each individual in the United States from 1980 to 2004. However, health care expenditures are not spread evenly across the population, and in fact only 5% of the population is responsible for 49% of the total healthcare expenses (AHRQ, 2006). Conversely, the lower 50% of utilizers are responsible for only 3% of health care expenses each year.

There are numerous contributing factors to the overall costs of health care in America, such as more expensive technology and costly malpractice insurance, but perhaps one of the most striking influences is the cost of chronic illness. The top fifteen costliest medical conditions account for 44% of the country's medical care expenses. The five most expensive conditions are heart disease, cancer, trauma, mental disorders, and pulmonary disorders, four of which are typically chronic conditions. Additionally, comorbidity of chronic conditions is a particularly large indicator of heightened expenditures. Specifically, patients who have more than one chronic condition have associated medical care costs that are seven times higher than patients with only a single chronic condition (AHRQ, 2006).

One explanation for these steep costs in patients with multiple medical needs is wasteful spending through inefficient models of care and a lack of successful prevention efforts. It has been estimated that as much as 765 billion dollars or nearly 30% of total health care expenditures can be attributed to wasteful spending (Institute of Medicine, 2012). The same report found that 55 billion dollars could be saved each year by implementing and capitalizing on prevention

opportunities and an additional 130 billion dollars of the excess could be eliminated with more efficient care delivery models. Another 100 billion dollars of excessive spending has been attributed to managing the consequences of poor medication adherence. Furthermore, it is estimated that as many as 60% of patients with chronic illness are not adherent to their prescribed treatment plans (Dunbar-Jacob, 2001). A better delivery system particularly for the management of chronic illnesses and improved management of patients with comorbid conditions is imperative.

Integrated Care

Integrated care has been suggested as a way to improve patients' access to healthcare professionals, reduce costs of care, and improve the quality of medical care (Auxier, Farley, & Seifert, 2011; Hoff, 2010; 2012; Walker & Collins, 2009). Primary care clinicians have generally responded positively to integrative care models, and perceive them as improving communication with mental health professionals, reducing stigma for their patients and providing better coordination of care. However, a gap remains between physicians' attitudes towards psychology within primary care and their use and understanding of the services (Funderbuck et al., 2010; Gallo et al., 2004; Westheimer, Steinley-Bumgarner, & Brownson, 2008). Some of this lack of clarity is due to the varying types and levels of integration that have been introduced. Blount (2003) described three levels of care which incorporate both medical and behavioral services including coordinated care, which is collaborative care in separate clinics, co-located care, which provides care within a single setting with independent medical and behavioral treatment plans, and integrated care, in which patients are treated within one treatment plan that includes both medical and behavioral team members.

The concept of integrated care as a more cost efficient and better delivery system for care has been advocated for over the past twenty years, however the implementation and research of these models has been slow to develop (Anderson, 1995; Baird, 1998). The role of psychologists in this integrated model continues to be explored and expanded. Early research has primarily been limited to descriptive reports of integrated programs, and suggestions for how psychologists can incorporate themselves into the medical home (Clark et al., 2009; Funderbuck, Fielder, DeMartini, & Flynn, 2012; Hunter, Goodie, Oordt, & Dobmeyer, 2009). More research is needed to determine the types of problems psychologists successfully treat in this setting, and which types of integration that are most effective (Barr, 2008; Correll, Cantrell, & Dalton, 2011; Gracia-Shelton & Vogel, 2002). A recent evaluation of an integrated clinic within an urban teaching hospital found that the inclusion of psychologists in the primary care program was effective (Sadock, Auerbach, Rybarczyk, & Aggarwal, 2014). Problem areas addressed included depression, anxiety, smoking, insomnia, chronic pain, and weight loss for 452 patients. However, these findings were limited due to the absence of a control group, and the authors call for future work to include clinical and utilization outcomes. Additionally, Sidorov (2008) calls for specific research on integrated care in patient populations with chronic illness and more complex needs.

Chronic Care Management of Complex Patients

Despite the proportion of healthcare spending that is attributable to patients with comorbid chronic conditions, most care delivery models remain focused on a single problem area (Katon et al., 2012; Wagner, Austin, & Von Korff, 1996). This is especially problematic for patients with comorbid mental health and physical health conditions. Forming integrated or collaborative care programs has been found to be a successful way to address these patients more

efficiently (Bodenheimer, Wagner, & Grumbach, 2002a/2002b; Bodenheimer, Lorig, Holman, & Grumbach, 2002). A two year study of patients with depression comorbid with diabetes, coronary heart disease or both, compared patients treated in a collaborative treatment program which they called “TEAM-care” to patients treated in a typical primary care clinic (Katon et al., 2012). Results indicated that the patients receiving TEAM-care had more depression-free days and also lower mean health care costs as compared to those seen in the usual primary care setting.

Woltmann and colleagues (2012) conducted a meta-analysis comparing the effectiveness of collaborative care models for patients with mental illness and comorbid physical illness with other care models and found a consistent pattern of positive patient outcomes for the collaborative care models. One exception to this was mixed results for patients with bipolar disorder and comorbid physical health conditions. It is possible that this difference indicates the limits of the management of psychological conditions within primary care even when mental health professional are incorporated and suggests the importance of making referrals to more traditional models of care when appropriate.

Although the research on collaborative care models for patients with chronic illness demonstrates such models’ success at improving disease-related outcomes in patients, a systematic review of the research to date found that this type of model does not consistently result in lower utilization costs (Woltmann et al., 2012). This finding might be explained by subsets of patients who are high utilizers of care and by the way in which costs were defined. As patients are managed more effectively within an integrated primary care program it is expected that they will have more visits with more providers, therefore their primary care-related healthcare expenditures will be increased as compare to their costs in a traditional care setting.

However, it is expected that outside costs such as emergency and inpatient care would be decreased offsetting the within clinic increase. Furthermore, better management and understanding of the patients at the highest percentiles of utilization may be necessary as well.

Frequent Care Consumers

As within the overall healthcare system, there is a small subset of patients within primary care who use a significantly larger proportion of services. These patients are considered high utilizers and create a drain on clinic resources as well as on the medical care providers. Certain demographic factors are related to heightened utilization including being female, being single or experiencing a breakdown of the marital relationship (David & Kaplan, 1995; Green & Pope, 1999). These disproportionately high utilizers typically have low socioeconomic status and are often unemployed (Gatchel & Oordt, 2003). High utilizers are also more likely to have certain types of medical conditions including cardiovascular disease, chronic pain, cancer, and respiratory disease.

Patients who are frequent utilizers also exhibit significantly higher levels of psychological distress and are more than twice as likely to have a psychiatric disorder as members of the community (Gatchel & Oordt, 2003). The top three mental health conditions among these high utilizers are depressive disorders, anxiety disorders, and somatization. Interestingly though, these patients tend to be highly focused on their physical health and in many cases do not identify themselves as being psychologically ill (Karlsson, Lehtinen, & Joukamaa, 1994). This is important to consider because, without the incorporation of psychologists as a standard component of care, these patients who may need intervention the most may also be the ones least likely to seek treatment.

Shen, Sambamoorthi, and Rust (2008) specifically tested the impact of co-occurring mental illness in patients with obesity and chronic physical illness on utilization and health care costs. They found that patients with mental health diagnoses had higher healthcare and pharmaceutical expenditures, were more likely to use the emergency department, and had more outpatient visits than patients without comorbid mental illness. These significant differences in utilization remained stable even when other factors related to high utilization were controlled for including gender, age, ethnicity, marital status, employment, poverty status, education, exercise, smoking, and health insurance (Shen, Sambamorhi, & Rust, 2008; Speer et al., 2004) In addition to showing that patients with mental illness are more likely to be higher utilizers, a recent study found that patients with comorbid mental and physical health conditions who were referred for psychological therapy showed reduced use of the emergency room as compared to those who were not referred (de Lusignan et al., 2013). These findings highlight the importance of considering psychosocial and mental health factors and employing mental health professionals into the care model when seeking to reduce utilization.

Mental Health Factors Influencing Utilization

Due to the unique and significant role of mental health factors on high utilization of medical care services, close attention should be given to these psychosocial influences. The literature indicates the primary mental health areas related to heightened utilization include general psychosocial distress, depression, anxiety, insomnia, and substance abuse (Koopmans & Lamers, 2007).

A systematic review of 53 studies on hospitalizations and physician visits explored demographic variables, physiological factors, and psychosocial concerns and found that although many elements play a role in higher utilization, depression and psychological distress were the

most predictive factors of utilization of hospital services and physician visits (de Boer, Wijker, & de Haes, 1997). A more recent study surveyed 201 patients presenting to a primary care clinic and achieved results consistent with de Boer and colleagues' findings, showing greater depression severity was predictive of utilization (Elhai, Voorhees, Ford, Min, & Frueh, 2009). Additionally, they found patients' perceived need for treatment and more positive treatment attitudes were also strongly predictive of utilization. Koopmans and Lamers (2006), specified that not only are depressive complaints associated with high rates of general healthcare utilization, but they are also especially related to the use of emergency paramedic services, prescription medications, and consulting medical specialists.

Anxiety is another important predictor of heightened utilization. A case-control study which prospectively examined the association of psychiatric disorders and health care utilization found depression, addictive disorders, and anxiety disorders were all associated with increased level of medical complexity, greater primary care visits, specialty care visits, and emergency medical care utilization (Ford, Trestman, Steinberg, Tennen, & Allen, 2004). However, the study also found anxiety disorder diagnoses had a unique contribution in high utilization independent of other mental health concerns. The relationship between anxiety disorders and high utilization was further explored in a study which evaluated utilization rates as they related to specific anxiety disorders. All of the anxiety disorders evaluated were related to high utilization, with few differences in utilization patterns noted between generalized anxiety disorder, obsessive-compulsive disorder, social phobia, and specific phobias (Deacon, Lickel, & Abramowitz, 2008). However, panic disorder patients in particular were the highest utilizers and attended the most medical visits overall, including numerous specialty visits to cardiologists and emergency room visits.

The prevalence rate of substance abuse in patients who are high utilizers of medical care is substantial, having been found to be as high as 49% in one study which looked at alcohol use problems among frequent care consumers. However, the relationship between utilization and substance abuse is different from that of depression and anxiety (Williams et al., 2001).

Although these patients are high utilizers of emergency room services, they are more inconsistent and less frequent visitors of primary care. Therefore, although they are high utilizers in some regards, they are also under-utilizers of primary care (Ford, Trestman, Tennen, & Allen, 2005; Narrow, Regier, Rae, Manderscheid, & Locke, 1993).

Another factor related to increased utilization, but not as widely researched with regards utilization to date, is insomnia. Sleep disturbance is highly comorbid with other conditions, but even when these factors are controlled for, insomnia remains significantly related to increased emergency room visits, calls to their physician, and use of pharmaceuticals (Hatoun, Kong, Kania, Wong, & Mendleson, 1998). Another study related insomnia to increased healthcare utilization through its association with more severe sleep-disordered breathing (Kapur et al., 2002). Their findings on the link between insomnia and increased utilization were modest, but due to its effects on quality of life and high comorbidity with other physical and mental health concerns insomnia remains an important area of focus for psychologists working with patients in primary care, particular if those patients are high utilizers of medical services.

The Role and Necessity of the Psychologist in Primary Care

Over half of the patients presenting to primary care medical clinics meet diagnostic criteria for a psychiatric illness, however many general medical practitioners report they are not comfortable assessing and diagnosing mental disorders (Browne, Lee, & Prabhu, 2007; Pirl, Beck, Safren, & Kim, 2001). Additionally, a greater percentage of patients are seeking and

receiving mental health treatment in general medical settings than in any other setting (Kessler et al., 2005; Wang et al., 2005; and Pirl et al., 2001). However, due to the limited presence of psychologists within these settings, the majority of these patients are receiving substandard levels of care (Wang, Demler, & Kessler, 2002).

Kessler et al. (2005) found there was a shift in mental health treatment over a 13-year period with an increase of over 150 percent in the rate of mental health treatment being received in medical settings versus other settings. Although a significant proportion of patients are receiving care in this setting, the authors go on to note many patients receiving treatment in this setting did not complete clinical assessment and were often not monitored and treated in an ongoing manner. A contributing factor to this substandard level of care is likely due to the fact the majority of these patients being treated are not being seen by mental health providers but rather by general medical providers who are lacking in specialized training (Wang et al., 2005).

Psychologists assisting in a cooperative and integrated fashion within primary care medical centers are necessary to fill this gap in service. The exact role which is filled by the psychologist in primary care varies and must be flexible based on the needs of the clinic, the medical providers, and the patients. Just as medical providers working within a primary care setting see a wide spectrum of diseases and conditions, psychologists working within the general medical setting see this same dissimilarity among patients. Due to this diverse range of problems and patient types there is not a single standardized protocol used by primary care psychologists.

Patients with clearly diagnosable conditions such as mood and anxiety disorders, and insomnia can often be effectively identified, treated, and managed using a brief outpatient model. In these cases the primary care psychologist works with patients and fellow providers to manage their symptoms within the integrated clinic. However, in the case of patients with more severe

cases or chronic mental health needs, or those requiring more comprehensive assessment or traditional psychotherapy, the primary care psychologist fills the role of first point of contact with mental health care, and directs patients to the appropriate external psychology or psychiatric provider (Knowles, 2009).

Additionally, many patients present with significant levels of distress and difficulty related to management of chronic illnesses and conditions such as diabetes, hypertension, obesity, and chronic pain. The primary care psychologist has the unique opportunity to work alongside medical professionals to help patients incorporate behavioral changes in their health practices through a process of evaluation and modification of the associated antecedents and consequences of these behaviors. In many cases, the psychologist provides psychoeducation related to the individual's condition, and when needed offers motivational enhancements to promote adherence and behavior change. This role of educator and motivator can also be used with patients who have specific goal-directed referrals such as smoking cessation or weight management.

Psychologists in primary care also serve the important function of easing the workload of overburdened physicians and medical providers by working with patients who are notoriously difficult from an interpersonal standpoint. At times, the psychologist may work directly with the primary care physician to provide techniques and patient management skills to aid in their communication skills and management of more complex patients. Conversely, the primary care psychologists also work with patients to improve their level of assertiveness and ability to communicate with their medical care team. At times the primary care psychologist may act as a liaison and actually facilitate communication between the physician and patient by directly sharing important information to improve the patient's overall care.

In addition to filling multiple distinct roles within the clinic as a whole, often times primary care psychologists must take on a variety of roles and approaches while working with an individual patient due to high comorbidities and overlap between conditions. Given this complex and assorted array of patients and problem types, primary care psychologists must have a wide breadth of knowledge. In addition to a broad knowledge base, they must also demonstrate comfort using specific targeted techniques to address the mental health, behavioral health, and interpersonal concerns they will face on any given day in a primary care setting.

Common Problems and Brief Treatment Models

Psychologists in primary care settings are faced with the same mental health diagnoses seen in more traditional mental health practices including mood and anxiety disorders, substance abuse, psychosis, insomnia, difficulties related to adjustment and bereavement, and personality disorders. Additionally, they work with patients to encourage behavioral health changes such as improved diet and exercise, smoking cessation, and adhering to a medical regimen related to chronic illness. Primary care psychologists implement components of empirically supported treatments similar to those approaches used in traditional mental health practices including Cognitive Behavior Therapy, and Acceptance and Commitment Therapy, as well as brief directed interventions such as Motivational Interviewing. Although working within a very different model of care, primary care physicians are able to build rapport and good therapeutic alliance with patients during their brief and sometimes fragmented visits (Corso et al., 2012). Delivery of psychological treatment in primary care settings has been shown to be effective and lasting even after only brief intervention (Bryan et al., 2012; Ray-Sannerud et al., 2012).

Depression and anxiety. Depression and anxiety continue to be the most prevalent mental health diagnoses in both general mental health practice and general medical settings (Pirl,

Beck, Safren, & Kim, 2001). In a descriptive study of common mental health referrals Pirl et al. (2001) found 48.7% of their referrals met criteria for major depressive disorder, and 30.8% were diagnosed with an anxiety disorder. Other psychiatric referrals included adjustment disorder, substance abuse, bipolar disorder, eating disorders, and dementia.

Depression in particular is of significant importance within primary care because of the level of functional impairment and impact on health status and outcomes with which it is associated. DiMatteo, Lepper, & Croghan (2000) reviewed the relevant literature on medical compliance of patients with depression and anxiety and reported that patients with depression are significantly more likely to have poorer adherence related to their medical care than patients who are not depressed.

Despite the frequency of depression in primary care and its consequences, for many patients the disorder continues to be managed at a suboptimal level in this setting (Gilbody, Bower, Fletcher, Richards, & Sutton, 2006). Psychologists can work cooperatively within the medical team to treat depression in an integrated way, therefore improving patient care and the effectiveness of primary care overall (Chung et al., 2013). Gilbody et al. (2006) reviewed 37 randomized studies which incorporated over 12,000 patients receiving treatment for primary care and demonstrated that a collaborative care model, which includes a mental health specialist, is superior to standard primary care in regards to depression outcomes. These results remained consistent across both short and long term outcomes. However, more research is needed to determine what the active component of collaborative care might be (Bower, Gilbody, Richards, Fletcher, & Sutton, 2006).

Another review of programs using disease management models for depression, many of which use a multidisciplinary approach, found the use of this model resulted in statistically

significant improvements in depression symptoms, patient satisfaction with care, and adherence to their treatment regimen (Badamgarav et al., 2003). Additionally, it was reported that this model worked to improve primary care physicians' ability to detect depression. However, Badamgarav et al.'s (2003) findings related to health care costs and utilization indicated this model was associated with higher costs and increased utilization. This result is likely due to the narrowly defined window by which health care costs and utilization were described in this study. These factors were limited to within-program utilization and costs, which would be expected to increase if patients are actively engaged in the collaborative program, however if a macroscopic view is taken, it would be anticipated that these program-specific costs and utilization would be offset by more costly emergency room visits, inpatient health-related hospital stays (as opposed to strictly psychiatric admissions), and outpatient specialty visits.

Although effective, the collaborative care model for depression is not immune to treatment difficulties seen in other settings. As with many comorbidities, patients with high levels of anxiety in addition to depression experience worse outcomes on measures of depression than patients with lower levels of anxiety when treated by a collaborative primary care team (Bauer et al., 2012). While not as common as depression within primary care, anxiety is still quite problematic. In addition to interfering with treatment for comorbid depression, anxiety alone also impairs patients' physical and mental functioning (Beard, Weisberg, & Keller, 2010). Furthermore, despite the prevalence and negative effects of anxiety as many as 41% of patients within primary care clinics meeting criteria for an anxiety disorder, including posttraumatic stress disorder, generalized anxiety disorder, panic disorder, or social anxiety disorder, reported they were not being treated (Kroenke, Spitzer, Williams, Monahan, & Lowe, 2007).

Insomnia. Insomnia is a significant problem which negatively impacts patients' quality of life, physical and psychological health, and life expectancy (Culpepper, 2005; Hatoum, Kong, Kania, Wong, & Mendelson, 1998). Insomnia is not an unusual occurrence, with sleep problems occurring in as many as 40% of adults in community settings; however, it is even more prevalent in primary care settings with reports of 69% of patients naming sleep problems as a health complaint (Ancoli-Israel & Roth, 1999; Culpepper, 2005; Kapur et al., 2002; Simon et al., 1997). Furthermore, insomnia is highly comorbid with psychological concerns including mood disorders and substance abuse (Doghranji, 2006). Even when comorbidities such as depression, anxiety, and chronic medical conditions are controlled for, the detrimental effects of insomnia on patients' quality of life remain (Katz & McHorney, 2002). The elevated prevalence of insomnia within primary care populations and its high comorbidity with other psychological illness supports the need for psychologists working within this setting.

Further support for the inclusion of psychologists in the management of insomnia in primary care comes from research evaluating physician comfort and success addressing sleep problems with their patients. The National Sleep Foundation conducted a survey, the results of which indicated the majority of patients do not discuss their sleep problems with their physician (The Gallup Organization for National Sleep Foundation, 1995). Additionally, physicians feel they do not have the appropriate training and are unqualified to assess and treat insomnia (Culpepper, 2005).

Another important consideration regarding the role of psychologists in primary care management of insomnia is the relative effectiveness of behavioral interventions for sleep problems as compared to pharmacological treatment. Psychoeducation about sleep hygiene is a first step intervention which should be given to patients experiencing sleep difficulties and can

be easily and quickly delivered by medical care providers. However, brief behavioral interventions have been found to be more effective than sleep hygiene education alone, and cognitive behavioral therapy for insomnia remains the gold standard for treatment of sleep problems (McCrae, McGovern, Lukefar, & Stripling, 2007; Morin, 1993).

Other behavioral health concerns. In addition to mental health diagnoses, psychologists are also able to address behavioral health needs with the primary care population. Mokdad, Marks, Stroup, and Gerbeding (2004) reported the top three leading causes of death are directly related to behavioral health areas that psychologists are trained to treat and manage in a primary care setting. Namely, tobacco use, poor diet and physical inactivity, and alcohol consumption were found to be the three top actual causes of death in the United States (Mokdad et al., 2004). Smoking and the combination of poor diet and physical activities accounted for roughly a third of all deaths or over 800,000 deaths in a single year. Over half of all deaths in the United States are attributable to primarily changeable behavioral and exposure-related factors.

Despite the prevalence of tobacco use there is limited research on the ability of psychologists to intervene and treat patients for smoking cessation in a primary care setting. Research on the effectiveness of primary care physician management of smoking cessation indicates even brief interventions are successful at achieving significant effects on cessation rates. These findings are based on a literature review of thirty-nine trials which included over 31,000 patients (Lancaster and Stead, 2004). Motivational interviewing for smoking cessation is a particularly effective strategy for smoking cessation, with a randomized controlled trial comparing motivational interviewing to anti-smoking advice finding that it was over five times more effective (Soria et al., 2006).

Motivational interviewing is also an effective way to address obesity and the need for weight loss in a primary care setting. Through a systematic review and meta-analysis Armstrong and colleagues (2011) found a motivational interview was associated with significant reductions in patients body mass index, as compared to control patients. In some cases physicians are prone to using judgmental or confrontational techniques which are in opposition to motivational interviewing. These techniques are not just unsuccessful at promoting weight loss. Pollack et al. (2010) established some patients receiving these types of interventions actually gained weight. The majority of weight loss research in primary care has focused on physician delivery of interventions, and more research is needed to evaluate the effectiveness of psychologists with this regard.

Chronic pain. There is wide variation across estimates of the actual prevalence rate of chronic pain, but it is generally agreed that the problem is significant in general medical settings, effecting as many as 100 million adults in the United States (Rowe & Caprio, 2013; Turk, Audette, Levy, Mackey, & Santos, 2010). Patients with chronic pain are more likely to have a comorbid psychiatric diagnosis with over half meeting criteria for at least one diagnosis (Turk et al., 2010). Furthermore, factors such as depression, psychosocial distress, and somatization have been shown to play a role in the development of chronic pain (Jensen, Moore, Bockow, Edhe, & Engel, 2011; Pincus, Burton, Vogel, & Field, 2002).

Leyshon (2009) asserts psychosocial factors which contribute to chronic pain and the patient's ability to cope should be considered by physicians and care providers when treatment is initiated rather than as a last resort. Psychologists working in primary care can assist physicians in evaluating how these factors are influencing an individual patient's experience of pain. Additionally, psychologists have the training and expertise to implement operant conditioning

strategies and Cognitive Behavioral Therapy, which are the two most common approaches to treating chronic pain (Turk et al., 2009).

Effects of Psychological Treatment on Health Status

In addition to improving patients' mental health wellbeing, it has been suggested that psychological treatment might also contribute to improvements in patients' health status as well (Park, Hong, Lee, Ha, & Sung, 2004; Wu et al., 2011). Depression and anxiety in patients with comorbid health conditions have been consistently associated with poor health behaviors and less than desirable adherence to medical regimens (Egede, Ellis, & Grubaugh, 2009; Khattab, Khader, Al-Khawaldeh, & Ajlouni, 2010; Park et al., 2004). Due to this relationship, it has been concluded that patients who receive mental and behavioral health interventions would be better able to manage their health-related needs including management of chronic illness such as diabetes, and also are more likely to implement positive behavioral changes such as quitting smoking, exercising more, and following a healthier diet. However, research evaluating the effects of psychological treatment on physiological factors such as hemoglobin A1c, cholesterol, and weight in diabetic patients has been mixed (Egede & Ellis, 2010).

In a study of patients with co-occurring depression and chronic illness, including diabetes and/or coronary heart disease, Katon and colleagues (2010) found patients in the intervention group exhibited improvements in hemoglobin A1c levels, LDL cholesterol levels, and systolic blood pressure in addition to improvements in their mood as compared with patients in the control group. A second study specifically focused on patients with diabetes evaluated the success of a psychosocial intervention and also found positive changes in hemoglobin A1c, weight, BMI, and LDL cholesterol for patients receiving the intervention (Tang, Funnell, Brown, and Kurlander, 2010). However, since quality of life, rather than depression or another aspect of

mental health, was not directly measured in this study the relationship between improvements in mental health and these physiological improvements cannot be evaluated. Additionally, Egede and Ellis' (2010) review of the research on the effectiveness of treating depression in individuals with diabetes found that although this treatment is consistently successful at treating depression, several studies have found hemoglobin A1c scores did not change. The exceptions to this pattern were studies which specifically used Cognitive Behavioral Therapy to treat depression. These studies did in fact show improvements in hemoglobin A1c in addition to improvements in depressive symptoms (Egede & Ellis, 2010).

While the conclusion that improving patients' mental health through psychological intervention would lead to improvements in physical health based on the research linking depression and anxiety with poor health outcome is a logical one, consistent research supporting this assertion is not available. In order to confirm these claims, research looking at the success of psychological intervention and mental health improvements in patients with comorbid medical conditions, and their ability to influence physiological outcomes and behavioral changes in self-care, is needed.

Statement of the Problem

It has been generally stated that integrating psychological services into primary care is the new frontier of mental health practices. Psychologists have been identified as having the expertise to effectively address mental health and behavioral health concerns within an integrated framework. As the frequency of integrated patient-centered medical homes grow and more psychologists enter the primary care work force, more research is needed to determine the effectiveness of these programs. A recent study in an urban teaching hospital evaluated the effectiveness of an integrated primary care program on commonly seen problems such as

depression, anxiety, and smoking cessation, and reported preliminary findings that the inclusion of behavioral treatments was effective and concluded further research is warranted (Sadock, Auerbach, Rybarczyk, & Aggarwal, 2014). More specifically, research is needed to elucidate the unique contribution psychologists make toward improving patient health outcomes, decreasing unnecessary utilization, and reducing exorbitant medical costs especially for high needs populations with multiple comorbidities.

During the first year of operation, the Complex Care Team effectively achieved improved patient outcomes and reductions in utilization (Virginia Commonwealth University Office of Health Innovation Data and Analysis, 2013). Specifically, preliminary findings showed a decrease in hospital costs of \$3,930,748.00 for the 443 patients paneled to the CCT clinic between November 1, 2011 and October 31, 2012. These cost savings were attributable to a 38% reduction of inpatient stays and a 28% reduction in emergency department use. Measures of patient health outcomes indicated that as costs and utilization decreased, patient health over the same year has improved. The percentage of patients within the CCT clinic with hemoglobin A1c under control increased from 45% to 55%, and the percentage of patients with their blood pressure under control increased from 31% to 50%. Additionally, the mean body mass index of CCT patients decreased from 42 kg/m², which falls above the cut off for extreme obesity, to 31 kg/m². These trends are promising and further research and evaluation is needed to determine the degree to which these improvements are attributable to the inclusion of psychology within this interdisciplinary framework.

The current study sought to provide a retrospective analysis of the role of psychology within the Complex Care Team (CCT), a truly integrated medical team dedicated to providing primary care services for patients with multiple chronic illnesses. This study served as a

continuation and extension of previous work in a similar setting evaluating psychology trainees working collaboratively within a primary care residency clinic, but was unique in that the Complex Care Team was comprised of a specific set of providers that worked closely together to manage patients with multifaceted medical, behavioral, and mental health needs.

The primary aims were to: 1) describe the patient population and identify factors related to increased utilization, active involvement with CCT psychology services, and patient outcomes; 2) provide more clarity on the effects of primary care psychology services in particular, on utilization, health outcomes and mental and behavioral health outcomes; and 3) to explore the relationship between improvements in psychological wellbeing and medical care utilization and measures of health status. Additionally, the current study sought to replicate findings from prior work in an integrated care clinic which found African American patients treated for depression did not experience the same improvement following psychological intervention as Caucasian patients.

Statement of Hypotheses

Based on the review of the relevant literature and the proposed aims of this study, the following hypotheses were evaluated:

Major Hypotheses: CCT Psychology Outcomes

1. CCT patients treated for diabetes, hypertension, and/or anticoagulation who were actively involved with CCT psychology (at least 4 visits, with at least 2 occurring within a single month) would demonstrate positive improvement in health outcomes, with respect to:
 - a) Hemoglobin A1c (less than 7%)
 - b) Body mass index within normal range for age (BMI: 18.5-25 or 23-30)

- c) Cholesterol under control (LDL-C less than 100mg/dl)
 - d) Blood pressure under control (less than 140/90 mmHg)
 - e) INR (percentage in range)
2. Patients who were actively involved with CCT psychology (at least 4 visits, with at least 2 occurring within a single month) would demonstrate significantly greater reductions in psychological distress as indicated by lower scores on the:
- a) Patient Health Questionnaire-9
 - b) Generalized Anxiety Disorder-7.
3. Patients who are actively involved with CCT psychology (at least 4 visits, with at least 2 of those occurring within a single month) and treated for a specific target area related to insomnia, chronic pain, smoking cessation, and/or weight loss will demonstrate improvements as indicated by Insomnia Severity Index, Short Form McGill Pain Questionnaire, number of cigarettes smoked per day, and/or BMI.
4. In the six months following their initial visit, patients who were actively involved with CCT psychology (at least 4 visits, with at least 2 of those visits occurring within a single month) would show significant decreases in utilization, in regards to:
- a) Emergency room visits
 - b) Inpatient stays
 - c) Outpatient specialty visits.
5. Among patients who had been seen by CCT Psychology, reductions in psychological distress would be significantly associated with greater decreases in utilization with respect to:

- a) Emergency room visits
 - b) Inpatient stays
 - c) Outpatient specialty visits.
6. Among diabetes, hypertension, and/or anticoagulation patients who had been seen by CCT Psychology, reductions in psychological distress would be significantly associated with more positive health outcomes with respect to:
- a) Hemoglobin A1c (less than 7%)
 - b) Body mass index within normal range for age (BMI: 18.5-25 or 23-30)
 - c) Cholesterol under control (LDL-C less than 100mg/dl)
 - d) Blood pressure under control (less than 140/90 mmHg)
 - e) INR (percentage in range).

Supplementary Analyses

A good unbiased control or comparison group was not available against which we could evaluate the improvements hypothesized above for patients treated by CCT Psychology. However, there was a subset of patients for whom outcome data were available who had only minimal (less than 15 minutes) contact with CCT Psychology via a brief introductory consultation. On a supplementary, exploratory basis the changes predicted for the CCT Psychology group were compared with those observed in the latter group.

Method

Setting

The Complex Care Team (CCT) is a multi-disciplinary group of coordinating providers from varying specialty areas that serve as an outpatient general internal medicine clinic. The CCT program is housed within the Ambulatory Care Clinic (ACC) at the Virginia

Commonwealth University (VCU) Medical Center, a large teaching hospital in Richmond, Virginia. The medical center is located in an urban setting and serves a large population of indigent patients who come from both urban and rural settings. The Complex Care Team is comprised of multiple providers from different disciplines including medicine, nursing, pharmacy, psychology, and social work, which are all targeted toward treating patients in a primary care setting. In between patient visits, providers work in a single shared workspace, allowing them to interact and actively engage each other throughout the day.

In addition to being physically located within the greater VCU Hospital System (VCUHS), the CCT clinic is linked to the entire VCUHS through an electronic medical record (CERNER), scheduling and billing systems (IDX). This virtual interconnectivity permits greater continuity of care for patients being treated within the clinic, as well as more comprehensive patient management. These electronic systems allows providers access to patient demographic data, appointment records, prescriptions history, and complete medical charts including inpatient and outpatient visit notes, laboratory and test results, as well as the ability to easily and securely communicate with other providers working within the team regarding the patients' needs.

The CCT clinic began enrolling patients on November 1, 2011. During the first year of operation the CCT clinic saw 365 patients over 2,447 attended visits. The clinic as whole has a no show rate of 15%. Physician and nurse practitioner visits accounted for 43% and 24% of these appointments, respectively, with the remaining 33% of scheduled appointments comprised of visits with the pharmacy, psychology, and social work. However, it is important to note that due to the symbiotic nature of the CCT clinic many patients are seen by pharmacy, psychology, and/or social work during their physician or nurse practitioner visit without having a scheduled

appointment with the additional provider. During any individual visit, a patient can see anywhere from one to as many as five different providers depending on their current needs.

A typical new patient visit with the physician or nurse practitioner would begin with the patient meeting with the nurse who would check the patient's vitals and serve as the first point of contact. The patient would then meet with their medical provider. The medical provider could then refer the patient to psychology, social work, or pharmacy or in many cases would simply "pull in" the appropriate provider(s) for a same day consult known as a "warm handoff". For psychology, a warm handoff generally includes an introduction to the patient and brief overview of the role psychology plays in primary care, and a brief screen of psychological symptoms. Patients identified as having a behavioral health need would then be scheduled for a follow up appointment with CCT psychology. A similar practice was used by the social workers. Additionally, psychology providers reviewed new and scheduled patients' medical charts to identify specific problems areas associated with their specialty area, such as a history of depression, a prescription for anxiolytics or narcotics, poor diabetes adherence, etc., allowing them to target patients who would benefit from their services.

Established patients had appointments similar to the scenario described above, but might also have had individual appointments scheduled specifically with social work, psychology, or pharmacy depending on their needs. Similarly, to the medical providers "pulling-in" other team members during their visits, the psychology, pharmacy and social work teams member consulted with the medical providers as needed during their visits as well, providing patients with comprehensive care at each visit. Furthermore, the team as whole met every 2-3 weeks to discuss patients who needed more directed attention and consult more thoroughly on particularly difficult cases.

Participants

Participants were 664 primary care patients with multiple chronic conditions assigned to the Complex Care Team (CCT) at the Ambulatory Care Clinic (ACC) within the Virginia Commonwealth University (VCU) Medical Center in Richmond, Virginia. The majority of patients assigned to the clinic were African-Americans, followed by Caucasians, with a small portion of other minority groups represented as well. Nearly all CCT patients were English speaking. There were slightly more male patients assigned to the CCT clinic than females. CCT patients ranged in age from 18 years of age to over 65, with those between the ages 45-64 years of age comprising the largest group. A large majority of patients assigned to the CCT clinic were unmarried and unemployed, and some were homeless.

The CCT clinic in particular served only low-income patients who meet criteria for coverage through the Virginia Coordinated Care (VCC) program. Additionally, in order to be assigned to the CCT clinic patients who had been accepted into the VCC program must meet a specific level of care determination which was defined through a set risk stratification protocol. This assignment process was based on a retroactive evaluation of an individual's healthcare utilization (i.e. total hospital costs, number of emergency department visits), and their medical health status (i.e. diagnoses, number of prescription medications). Patients were assigned to one of three levels of care, with Level 3 signifying the highest level of risk. Potential Level 3 patients were identified by nurse referrals as patients who had at least two chronic diagnoses, and at least three recent emergency department visits or hospitalization. Through a process of categorization and modification, the risk stratification protocol assigned patients who had 20,000 dollars or more in hospital costs, greater than 12 emergency department visits and more than six prescriptions to the Level 3 category.

In order to be assigned to the CCT clinic patients must have lived within the covered geographical catchment area and be identified as a Level 3 VCC patient. All patients seen in the CCT had multiple comorbid conditions, and a large proportion had at least 3 or more comorbid conditions. The three most common comorbidities of patients assigned to the CCT clinic during the first year of operation were hypertension (72%), a mental health diagnosis not including dementia or substance use (51%), and diabetes (47%), respectively. These top three conditions were followed closely by injuries, coronary artery disease, chronic pulmonary disease, congestive heart failure, and cancer, each of which was represented in more than 25% of the CCT patient population. Additionally, 11-12% of the patients assigned to the CCT clinic had drug and alcohol use diagnoses.

The team of nurses, physicians, social workers, and pharmacists were licensed and credentialed providers. The two psychology team members were advanced graduate students from the Virginia Commonwealth University clinical psychology doctoral program. These trainees had exhibited an interest in adult behavioral medicine, and had received concentrated training, experience, and supervision within related clinics for several years. Additionally, the psychology student clinicians on-site received on-site supervision by licensed clinical psychologists who specialized in health psychology, and also attended biweekly group supervision meetings with their supervisors and other doctoral level graduate students.

Procedure

The physician, nurse practitioner, and social work members of the Complex Care Team (CCT) directly referred patients who they believed might benefit from psychological intervention to the psychology student clinicians for behavioral health screening and intervention. Additionally, the student clinicians regularly reviewed scheduled patients' medical charts to

identify those with possible mental health concerns. Once a patient had been identified as a candidate for behavioral intervention, the student clinician introduced their services and conducted a brief screening on the same day when possible. If the psychology team member was unavailable for a same day consultation, the patient was referred for a scheduled appointment with the student clinician on another day. Follow up appointments were scheduled as needed if and when patients were receptive to working with the psychology team member. Typical appointments were brief and between 20-30 minutes in length, as compared to traditional mental health appointments which are 45-50 minutes in length.

Following the initial introduction to services and identification of a specific problem area, the student clinician administered a brief intervention directed towards the area of focus for each consult. Although this intervention was not completely standardized due to the variation and complexity of the types of problems seen across patients in the clinic, the student clinician selected an appropriate intervention from a set of brief interventions, which were consistent with empirically validated treatment practices (see Appendix 1). This routine was consistent with the typical treatment approach used by primary care psychologists described in the relevant literature. Patients were scheduled for follow up appointments based on several factors including the identified problem area, patient willingness, availability, and access to transportation.

The psychology team members used a standard note template for each patient encounter in which they indicated the reason for referral, length of contact with the patient, the primary problem areas identified, the specific focus of the consult, the methods of intervention implemented during the session, a brief summary of the visit, a brief treatment plan update, and recommendations for the medical care providers when appropriate. The student clinician also reported the patients' scores on the two brief psychological screening measures used as standard

practice within the CCT clinic, the Generalized Anxiety Disorder-7 (GAD-7; Spitzer, Kroenke, & Williams, 2006) and the Patient Health Questionnaire-9 (PHQ-9; Spitzer, Kroenke, & Williams, 1999) as well as the scores of any additional assessments which are deemed appropriate including the Insomnia Severity Index (ISI; Morin, 1993) and the Short-form McGill Pain Questionnaire (SF-MPQ; Melzack, 1987). The student clinician also reported the patients subjective pain score on a scale of 0-10 with 0 equally no pain and 10 equally the highest level of pain imaginable for patients being treated for chronic pain management, and the number of cigarettes smoked per day on average for a patient seen for smoking cessation. The routine collection of this information and inclusion within the electronic medical records was consistent with the best practices for primary care research outlined by de Lusignan and van Weel (2006).

Using of a list of medical record numbers (MRNs) provided by the VCC program to identify patients assigned to the CCT clinic, the graduate student clinician reviewed medical records for each patient. Information related to mental health referrals, length and type of contact with psychology, type of intervention, and assessment scores was gathered from the previously described visit notes. Additionally, the participants' demographics, and basic medical information including their height, weight, diagnoses, and disease related physiological markers were gathered from a review of patients' medical records. Patients utilization of medical care within the CCT clinic specifically, as well as their utilization of medical care outside the clinic including emergency department visits, inpatient stays, and specialized outpatient visits were gathered from the VCC program. The VCC administrators kept an account of all patient visits within VCU HS and billing records for services received outside the health system, such as visits with the Daily Planet, a local community provider for low income patients which commonly

served the psychiatric and psychological needs of some CCT patients requiring more traditional psychotherapy who were not well managed within the primary care model.

Patients' utilization information was used to assess their level of engagement within the CCT clinic and with psychology specifically. Patients who were identified as having attended a minimum of three or more visits with at least three different types of providers (medical, psychology, social work, or pharmacy) were classified as effective utilizers of the CCT integrated clinic. Patients who attend at least four visits with psychology, with at least 2 visits occurring within a single month were considered actively engaged with psychology.

Measures

Self-report measures, physiological measures of disease management, and a patient information sheet to be completed by the doctoral students were used in this study. Study measures are included in Appendix A.

Participant demographics and basic medical information. The doctoral student completed a paper-and-pencil questionnaire for each participant after a review of medical records (see Appendix 2). This measure included basic demographic information such as age, gender, race, marital status, socioeconomic status, and employment status. Relevant medical information, such as the number and types of medical and mental health diagnoses was also collected and listed on the demographics questionnaire including Hemoglobin A1c, cholesterol, body mass index, blood pressure, and INR ratings.

Hemoglobin A1c (HbA1c). Hemoglobin A1c is a laboratory test that reports the average level of a patient's blood sugar over the past three months and is a widely used measure of how well a patient is controlling their diabetes (American Diabetes Association, 2010). Glycemic control is a fundamental component of the management of diabetes with high HbA1c levels

being associated with increased microvascular and neuropathic complications of type 1 and type 2 diabetes. HbA1c scores of 5.6% or lower are considered normal, scores between 5.7 and 6.4% are represent a pre-diabetic state, and scores 6.5% or higher indicate a diagnosis of diabetes. The American Diabetes Association (ADA) recommends that providers work with their patients to maintain a target HbA1c level below 7.0% for nonpregnant adults (ADA, 2010). The ADA recommends that patients who have good control of their diabetes have their HbA1c tested twice a year but recommends more frequent testing, four times a year, for patients who struggle to maintain glycemic control.

The CCT psychology student reviewed medical records to obtain patients' HbA1c scores. Patients' HbA1c initial score upon intake to the CCT clinic as well as their score following their most recent visit were recorded. Consistent with the ADA recommendation, patients with a score below 7.0% were considered having good control of their diabetes.

Low-density Lipoprotein Cholesterol (LDL-C). Low-density lipoprotein cholesterol (LDL-C) is a target of cholesterol-lowering medical treatments due to lower LDL-C levels being related to decreased heart attacks, deaths due to coronary heart disease (CHD), and overall mortality rates (Talwalker, Sreenivas, Gulati, & Baxi, 2013). LDL-C is a widely accepted measure of risk for heart disease with specific target guidelines for patients with different clusters of health factors. These target values are based on specific risk factors including cigarette smoking, age, high blood pressure, family history of heart disease, pre-existing coronary heart disease and diabetes (National Cholesterol Education Program, 2001). LDL-C of less than 100 mg/dL is considered optimal; however, the target LDL-C for patients with 0-1 risk factors is 160 mg/dL and 130 mg/dL for patients with 2 or more risk factors, according to the National Cholesterol Education Program (NCEP, 2001). Due to the significant increased risk in

patients with pre-existing heart disease or diabetes, the NCEP reports a target LDL-C of less than 100 mg/dL, and other organizations suggest LDL-C targets of as low as 70 mg/dL for patients who have had a prior heart attack.

The student clinician reviewed patients' medical records to obtain patients LDL-C results. Patients' LDL-C results upon intake to the CCT clinic as well as their score following their most recent visit were recorded. Due to the high rates of hypertension, diabetes, and further comorbidities in the CCT clinic, a LDL-C of less than 100 mg/dL was used as a target to indicate cholesterol which is under control.

International Normalized Ratio (INR). The International Normalized Ratio (INR) is the standardized way of representing the results of the Prothrombin Time Test or Protome Test (PT). The PT is used to determine the degree of anticoagulation or blood thinning and indicates whether a patient is within the therapeutic window of anticoagulation pharmaceutical treatment (Wigle et al., 2010). An INR score higher than the target range signifies that a patient is at an increased risk of bleeding, while a lower than desired INR score indicates that a patient is at heightened risk of forming a blood clot (Hasan et al., 2011). Generally an INR of 2.0 to 3.0 is considered to be within the therapeutic range, however a medical provider may alter an individuals target range based on factors related to their treatment needs. In other words, one patient's target range may differ from another patient's target range, and might also differ from their own target range over time depending on their circumstances and changing medical conditions. Additionally, some patients may require more frequent INR testing, in some cases as often as several times a week, while others might go several weeks in between INR checks. Consistent with the method used by Hasan et al. (2011), INR control will be measured by the percentage of INR scores within range by dividing the number of in range visits over the total

number of visits over a distinct time period. This method accounts for the individual variability in the frequency of INR testing and therapeutic target range, rather than simply reported scores as in or out of range.

The student clinician reviewed the medical records to obtain INR scores for each patient receiving anticoagulation treatment as well as the associated target range indicated by their provider for the given time period. The first ten sequential INR scores were collected beginning with the patients' intake into the CCT clinic, as well as their ten most recent sequential INR scores.

Body Mass Index (BMI). Body mass index (BMI) is one measure used to determine if a person is overweight or obese. An individual's BMI is calculated using the following formula: $\text{weight (lb)} / [\text{height (in)}]^2 \times 703$. Although BMI is sometimes criticized as an overly simplistic measure of a person's general health, this simplicity provides clinicians, researchers and patients with a quick and easy tool to reference when managing weight. High BMI scores are indicative of increased risk and poorer outcomes of multiple chronic conditions including, but not limited to, coronary heart disease, diabetes, hypertension, sleep apnea and respiratory problems, and dyslipidemia or high cholesterol (National Institute of Health (NIH), National Heart Lung and Blood Institute, & The National Institute of Diabetes and Digestive and Kidney Diseases, 2003).

BMI scores are grouped into four clusters or weight ranges including: <18.5 as underweight, 18.5-24.9 as normal weight, 25.0-29.9 as overweight, and 30.0 and above as obese for adult patients through the age of 64 years. The normal weight range for patients over the age of 64 years is higher with BMI scores of 23-30 indicating normal weight for this age group. Additionally, patients with BMI scores of 40 or higher are sometimes given a more specific classification of extreme obesity (NIH et al. 2003).

A patients' BMI was obtained from a review of their medical records. The student clinician recorded the BMI at the time of the patients' intake to the CCT clinic, as well as their BMI at their most recent visit.

Blood pressure. Blood pressure is a measure of the force of blood against the walls of person's arteries when the heart muscle is contracting, represented as systolic pressure, and when the heart is resting, represented as diastolic pressure. There are four general categories used in management of cardiovascular disease including: 1) normal, which is a systolic blood pressure less than 120 and diastolic blood pressure less than 80 or 120/80mmHg, 2) prehypertension, which is a systolic blood pressure between 120 and 139 and diastolic blood pressure between 80 and 89, 3) Stage 1 hypertension, which is a systolic blood pressure between 140 and 159 and diastolic blood pressure between 90 and 99, and 4) Stage 2 hypertension, which is a systolic blood pressure greater than or equal to 160 and diastolic blood pressure greater than or equal to 100 (U.S. Department of Health and Human Services (USDHHS), National Institute of Health, & National Heart, Lung, and Blood Institute, 2003).

High blood pressure is a consistent and independent measure of health risk which is associated with greater incidence of heart attacks, heart failure, stroke, and kidney disease. In terms of risk, managing systolic blood pressure is of particular importance especially for patient over the age of 50 years (USDHHS, 2003).

Medical records were reviewed to obtain patients' systolic and diastolic blood pressure. Patients' blood pressure at their initial intake to the clinic were recorded as well as their blood pressure at their most recent visit. Consistent with the recommended target guidelines, blood pressure below 140/90 mmHg was considered good control of hypertension.

Insomnia Severity Index (ISI). The Insomnia Severity Index (ISI; Morin, 1993) is a brief self-report measure of insomnia which was designed for use in medical populations. Patients were asked to rate three sleep-related problems on a scale from 0 = none to 4= very severe, and to answer four additional questions related to their experience of their sleep problems on the same 0 to 4 point scale with anchors which are congruent with the wording of each question (see Appendix 6). The patient's scores for each item were summed to give a total ISI score indicating the severity level of their insomnia. Bastein, Vallieres, and Morin (2001) normed the ISI on a sample of 145 patients and found it to have good internal consistency (Cronbach's alpha = .74 -.78). Additionally, Bastein et al. (2001) developed a set of cutoff scores by evaluating patients' ISI scores in conjunction with their sleep diaries and polysomnography. ISI scores of 0-7 indicate no significant insomnia, scores of 8-14 indicate sub threshold insomnia, scores of 15-21 indicate moderate clinical insomnia, and scores of 22-28 indicate severe clinical insomnia (Bastein et al., 2001).

Short-form McGill Pain Questionnaire (SF-MPQ). The Short-form McGill Pain Questionnaire (SF-MPQ; Melzack, 1987) is a brief self-report measure which asks patients to rate their current level of pain across several descriptive terms. The 15 descriptors are divided into 11 sensory terms such as "shooting" and "burning" and 4 affective terms such as "fearful" (see Appendix 5). Patients were asked to indicate how closely each term matches their current experience of pain using a scale which ranges from 0=none to 3=severe. These fifteen score were summed to give an overall pain score. Additionally, patients were asked to rate the general intensity of their pain on a scale from 0 (no pain) to 10 (worst possible pain) and to mark their current pain on a visual line representation of this same scale.

As compared to the original full length McGill Pain Questionnaire (MPQ), the SF-MPQ is preferential for use in primary care clinics due to its brevity and ease of administration.

Cigarette use. The CCT psychology student clinician queried patients about their average daily cigarette use over the past week and recorded the number of cigarettes smoked per day in their medical chart.

Patient Health Questionnaire-9 (PHQ-9). The Patient Health Questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001) is a brief nine-item self-report measure developed from the depression module of the PRIME-MD diagnostic interview. This measure is self-administered and is used to assess symptoms of depression and their impact on functional impairment over the past two weeks. Each item is rated on a 4-point Likert type scale asking how often the individual has been bothered by each individual symptom ranging from 0= not at all, 1= several days, 2= more than half the days, and 3= nearly every day (see Appendix 4). The PHQ-9 is commonly used in primary care settings and has been found to be useful for diagnostic screening and treatment monitoring purposes (Tamburrino et al., 2009; Klinkman, 2009). The nine items correspond to the diagnostic criteria for major depressive disorder as identified in the Diagnostic and Statistical Manual - Fourth Edition, Text Revision (American Psychiatric Association, 2000). There is good support for the validity and reliability of the PHQ-9 in medical settings across a variety of ethnic groups based on exploratory factor analysis of 5,053 primary care patients identifying as non-Hispanic white (n=2,520), African American (n=598), Chinese American (n=941), and Hispanic (n=974) which demonstrated one factor loading for each group ranging from .79 to .89 (Huang et al., 2006).

The diagnostic validity of the shorter PHQ-9 has been found to be comparable to the original fifteen item clinician administered instrument, and a range of cutoffs have been

determined to aid clinicians in providing meaningful interpretations of the scores (Kroenke et al., 2001). As scores increase, each of the five ranges of severity correlates to an increased likelihood of a diagnosis of major depressive disorder.

Generalized Anxiety Disorder-7 (GAD-7). The Generalized Anxiety Disorder-7 (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006) is a screening tool which is useful for assessing and tracking symptoms of generalized anxiety. The GAD-7 is a brief self-administered seven-item measure. Individuals are asked to rate how often they have been bothered by each symptom over the last two weeks using a 4-point Likert type scale ranging from 0= not at all, 1= several days, 2= more than half the days, and 3= nearly every day (see Appendix 3). The patients rating on each item is added together for an overall score which is associated with a descriptive range with scores of 0-4 indicating no anxiety or symptoms within normal limits, 5-9 indicating mild anxiety, 10-14 signifying moderate anxiety, and scores of 15 and higher are considered severe anxiety.

The items included on the GAD-7 were developed using the diagnostic criteria for generalized anxiety disorder as identified in the Diagnostic and Statistical Manual - Fourth Edition, Text Revision (American Psychological Association, 2000). This scale was normed across 15 primary care clinics on 2,739 individual patients and has been shown to have both good reliability and validity for identifying a likely diagnosis of an anxiety disorder, (Spitzer et al., 2006). Specifically, its seven items had high internal consistency (Cronbach's alpha = .92) and suitable test retest reliability (intraclass correlation = .83). Additionally, a factor analysis determined depression and anxiety, while related, were identified distinctly (Spitzer et al., 2006).

Data Analyses

To test hypotheses 1a-e, 2a-b, and 3, stating patients who are seen by CCT psychology will have improvements in health, mental health outcomes, and behavioral health outcomes, paired samples *t*-tests were used to evaluate the results. To test the hypotheses 4a-c, stating participants actively engaged with CCT psychology will demonstrate reduced utilization of the emergency room, inpatient services, and outpatient specialty visits paired *t*-tests were conducted. Due to the non-normal distribution of the utilization variables, data were log transformed prior to analysis in order to allow for parametric testing. To test the remaining hypotheses 5-6, multiple linear regression analyses was used to evaluate the relationship between active participation in the CCT clinic and changes in psychological distress and behavioral health using PHQ-9, GAD-7, ISI, and SF-MPQ scores. Additionally, multiple linear regression analyses were used to assess how changes in mental health wellbeing, as measured by PHQ-9 and GAD-7 scores, mediate utilization of medical services.

To test the supplementary and exploratory hypotheses which compares patients who are engaged with CCT psychology to those who are only minimally involved an Analysis of Variance were used. ANOVA has been suggested as a preferable alternative to non-parametric testing such as Mann-Whitney for when evaluating change from baseline, so after checking for normality data were transformed if needed prior to analyses (Vickers, 2005).

Results

Characteristics of the Sample

The initial database is comprised of data obtained from all patients who were paneled to the Complex Care Team (CCT) Clinic from the date the clinic opened, November 1, 2011, and January 15, 2014. Basic demographic information and appointment attendance was collected for all 664 patients who were paneled to the CCT clinic; however, 97 individuals were excluded

from further data collection and analyses because they did not present for a single visit with a CCT provider during the study window. Of the remaining 567 individuals who were seen at least once by a CCT provider, 317 participants saw a CCT provider at least once or twice, but either were not seen again or were not seen by at least 3 different types of providers; 250 participants were identified as effectively utilizing the integrated CCT team (meaning that they attended at least 3 CCT visits and saw at least 3 types of CCT providers). Additionally, 311 patients or 54.9% attended at least one psychology appointment and 88 individuals were identified as being actively involved with CCT psychology specifically (meaning that they attended at least 4 visits, with at least 2 of those occurring within a single month).

The 88 adults actively engaged with CCT psychology were 33 males (37.5%) and 55 females (62.5%) with a mean age of 48.97 year ($SD = 8.95$). The sample was comprised of 60 African Americans (68.2%), 26 Caucasians (29.5%), and 2 individuals that identified as another race (2.3%). In regards to ethnicity 87 participants (98.8%) identified as non-Hispanic, and one participant was Hispanic (1.1%). The majority of the participants engaged with CCT psychology were single ($N = 50$, 56.8%), 16 (18.2%) were divorced, 11 (12.5%) were married, 9 (10.2%) were separated, and 2 (2.3%) were widowed. The great majority of the CCT psychology patients were unemployed ($N = 75$, 85.2%), and 1 participant was retired (1.1%). Of the 12 who were currently employed, 6 were employed part time (6.8%), 3 were employed full time (3.4%), and 3 were self-employed (3.4%).

The sample of participants who were actively engaged with psychology was generally similar to the overall sample of all CCT patients, and differed on only one demographic factor. Out of the total 664 patients paneled to CCT between November 1, 2011 and January 15, 2014, 53.5% of the patients were male and 46.5% were female; therefore the gender distribution

between the overall sample and the CCT psychology sample differed significantly, $X^2(1, 664) = 10.93, p = .012$. The mean age of the overall CCT population was 50.90 ($SD = 11.04$) and did not differ significantly from those actively engaged in CCT psychology. Similarly to the CCT psychology sample, the overall CCT sample was comprised of two primary racial groups with 65.2% African American and 30.3% Caucasian with 98.4% identifying as Non-Hispanic. The overall CCT sample was also similar to the CCT psychology subset in regards to marital status with 52.3% being single, 19% divorced, 13.7% married, 9.6% separated, and 5.4% widowed.

Among all of the 664 participants paneled to the CCT clinic, there were no significant differences between these groups demographically regardless of their level of engagement with the overall clinic. The gender distribution, age, marital status, race, and ethnicity were similar for those who never attended a CCT appointment, those with limited engagement, meaning they attended fewer than 3 appointments or saw fewer than 3 types of providers, and those who fully engaged with CCT as a whole, meaning they attended at least 3 CCT visits, and saw at least 3 types of providers (see Table 1).

Table 1.

Demographics for patients in CCT across level of clinic engagement.

	N	Gender	Race (Ethnicity)	Marital Status	Employment
Total CCT <i>M</i> = 50.90 yrs <i>S.D</i> = 11.04	664	Male: 53.5% Female: 46.5%	Black: 65.2% White: 30.3% (Non-Hispanic = 98.4%)	Single: 52.3% Married: 13.7% Divorced: 19% Separated: 9.6%	Unemployed: 84.9% Employed: 11.2% Retired: 3.6%
No Appointment <i>M</i> = 49.92 yrs <i>S.D</i> = 11.8	97	Male: 52.6% Female: 47.4%	Black: 62.9% White: 30.9% (Non-Hispanic = 96.9%)	Single: 56.7% Married: 8.2% Divorced: 17.5% Separated: 11.3%	Unemployed: 85.6% Employed: 10.3% Retired: 3.1%
Limited CCT <i>M</i> = 50.70 yrs <i>S.D</i> = 12.23	317	Male: 55.2% Female: 44.8%	Black: 62.8% White: 32.5% (Non-Hispanic = 98.4%)	Single: 48.6% Married: 18.9% Divorced: 17.7% Separated: 8.8%	Unemployed: 83.6% Employed: 12% Retired: 4.4%
Engaged CCT <i>M</i> = 51.54 yrs <i>S.D</i> = 8.95	250	Male: 51.6% Female: 48.4%	Black: 69.2% White: 27.2% (Non-Hispanic = 98.4%)	Single: 55.2% Married: 9.2% Divorced: 21.2% Separated: 10%	Unemployed: 86.4% Employed: 10.4% Retired: 2.8%
CCT Psychology <i>M</i> = 48.97 yrs <i>S.D</i> = 8.95	88	Male: 37.5% Female: 62.5%	Black: 68.2% White: 29.2% (Non-Hispanic = 98.8%)	Single: 56.8% Married: 12.5% Divorced: 18.2% Separated: 10.2%	Unemployed: 85.2% Employed: 10.2% Retired: 1.1%

CCT Clinic Engagement

Between November 1, 2011 and January 15, 2014 the 567 patients enrolled in the CCT clinic attended 7,652 non-psychology CCT appointments and 1,393 CCT psychology appointments for a total of 9,045 CCT appointments. The mean number of non-psychology visits during this timeframe was 13.50 (*SD* = 11.45) with the number of visits ranging from 1 to 67 with a median of 10 visits. When narrowing the view to the 250 patients who attended more than 2 CCT visits with at least 3 providers the mean number of visits increased to 21.34 (*SD* = 11.74) with a median of 20 visits. The CCT visit counts are a low estimate of the total number of visits because visits with all disciplines were not always scheduled in the computer. The median

number of CCT psychology visits for the overall CCT enrollees was 1 visit ($N = 567$) and 2 visits when isolating only those who effectively engaged in the CCT clinic ($N = 250$).

During this same time period, the 88 patients identified as engaged CCT psychology utilizers attended 3,204 CCT visits comprised of 951 CCT Psychology visits and 2,253 CCT clinic visits with non-psychology providers. The mean number of non-psychology CCT visits for the CCT psychology patients was 25.60 ($N = 88$, $SD = 13.43$) with a median of 24 visits. The mean number of CCT psychology visits for the CCT psychology utilizers was 10.81 ($SD = 7.75$) with a median of 9 psychology visits. There was no significant difference between the number of CCT non-psychology visits or psychology visits attended for those engaged with CCT psychology based on gender or race.

Table 2.

CCT Utilization Mean and Standard Deviation for Non-Psychology Visits and Median Psychology Visits by level of engagement.

	Non-Psychology CCT 7,652 Total Visits	CCT Psychology 1,393 Total Visits
Total CCT Clinic N=567	13.5 (11.45)	Median = 1 visit
CCT Engaged N=250	21.34 (11.74)	Median = 2 visits
CCT Psychology N=88	25.60 (13.43)	Median= 9 visits

Health Outcomes

Body Mass Index (BMI). Body Mass Index was used as a measure of weight management and as a general health marker. Patients engaged with CCT psychology ($N = 88$) had an average BMI of 34.62 kg/m² ($SD = 16.42$) at intake to CCT clinic. The group’s average BMI dropped to 34.07 kg/m² ($SD = 10.16$) post CCT participation. The slight reduction in BMI

across the two time points was not significant, $t(87) = .525, p = .601$. There was no significant difference in average BMI at intake based on gender. An independent samples t-test indicated that women tended to have a higher average BMI at follow-up than men, however this difference did not reach statistical significance, $t(86) = -1.955, p = .054$. There were no differences in initial or follow-up BMI based on race.

Hemoglobin A1c (HbA1c). Hemoglobin A1c was used as a measure of how well participants controlled their diabetes. Of the 88 patients engaged with CCT psychology, pre and post HbA1c scores were collected for the 60 individuals receiving care for diabetes. The average HbA1c at intake was 7.46 ($SD = 2.33$). At the second time point, the mean HbA1c for the CCT psychology group reduced to 7.03 ($SD = 2.23$). The reduction in A1c following engagement with CCT was significant, $t(59) = 3.059, p = .003$. There were no effects of gender or race at either time point for HbA1c scores.

Low-density Lipoprotein Cholesterol (LDL-C). Low-density lipoprotein cholesterol (LDL-C) was used as a measure of heart disease risk. At intake, CCT patients who were engaged with psychology had average LDL-C of 114.90 mg/dL ($N = 69, SD = 42.40$). Follow up LDL-C scores were collected for 52 patients. Their average LDL-C decreased after engagement with CCT psychology to 109.10 mg/dL ($N = 52, SD = 42.40$). The reduction in LDL-C scores was significant $t(51) = 2.410, p = .020$. There was no significant difference in LDL-C scores between males or females, or by race at either time point.

Blood pressure. Paired samples t-tests indicated that patients systolic blood pressure improved significantly at follow up as compared to intake $t(87) = 1.92, p = .05$, from a mean of 137.8 to 131.4; however, the reduction in diastolic blood pressure was not significant $t(87) = 1.11, p = .27$. Patients were categorized into one of four groups, normal, prehypertension, Stage

1 hypertension, or Stage 2 hypertension based on their systolic and diastolic blood pressure using the recommendations made by the U.S. Department of Health and Human Services (USDHHS), National Institute of Health, & National Heart, Lung, and Blood Institute (2003). At intake 22 patients (25.0%) were categorized as having blood pressure in the normal range, 27 (30.7%) fell within the pre-hypertension range, and 39 (44.3%) had hypertension with 16 (18.2%) in Stage 1 hypertension and 23 (26.1%) in Stage 2 hypertension. After engagement with CCT psychology 20 (22.7%) patients fell within the normal range, 39 (44.3%) were in the pre-hypertension range, and 29 (33%) had hypertension with 22 (25%) in Stage 1 hypertension and only 7 (8%) in Stage 2 hypertension (See Figure 1). The McNemar-Bowker test demonstrated that the reduction in the proportion of patients with higher hypertension scores post-CCT involvement was significant, $X^2(6, 88) = 13.44, p = .037$.

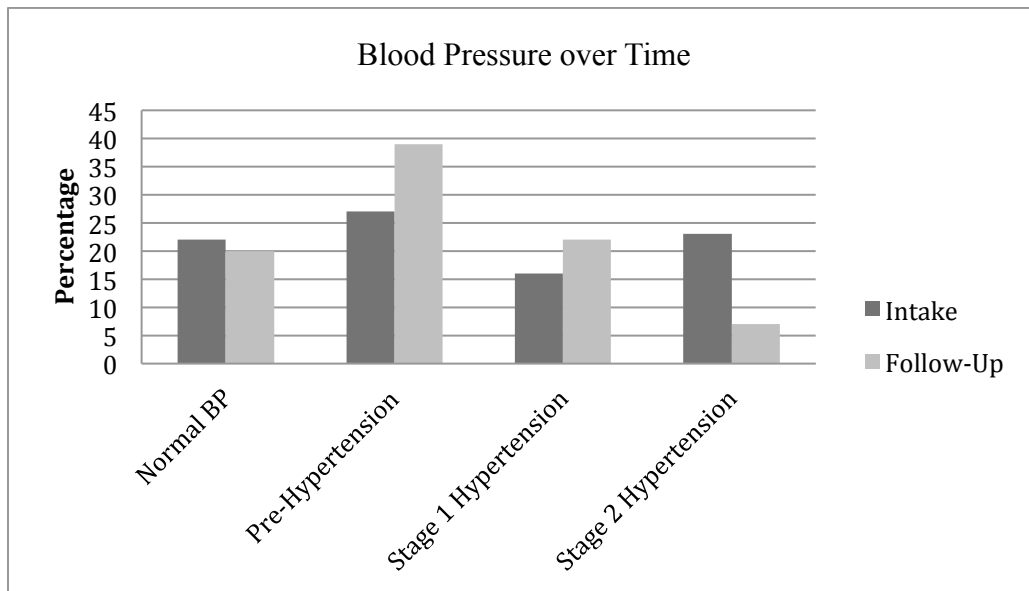


Figure 1. Percentage of engaged CCT psychology patients in each blood pressure category at intake and at follow-up.

International Normalized Ratio (INR). The International Normalized Ratio (INR) is the standardized way of representing the results of the Prothrombin Time Test or Protome Test

(PT), and indicates how adherent a patient is on anticoagulation medication. Partial data were gathered for some participants, however there was insufficient data within the medical record to establish the percentage of INR scores in range at intake or following CCT participation for a sufficient number of patients to warrant analyses. Therefore, anticoagulation data were not analyzed.

Psychological Distress and Behavioral Health

Patient Health Questionnaire-9 (PHQ-9). The PHQ-9 was used to measure depression. Sixty-eight of the participants engaged with CCT psychology completed an initial PHQ-9, and 54 completed a follow up PHQ-9. PHQ-9 scores ranged from 0-27 at both intake and follow-up. Of those that completed both initial and follow-up scores, 33 individuals had a reduction in PHQ-9 scores, 14 increased, and 7 had no change. The majority of patients fell into the severe depression descriptive group at intake, followed by moderately-severe, moderate, mild, and no depressive symptoms (see Table 3). The number of patients within each descriptive group decreased at follow-up with the exception of the no depressive symptoms group which increased. PHQ-9 change scores tended to be highest for those with initial depression scores in the moderate to moderately-severe range, however an analysis of variance indicated that the difference was not significant $F(4, 53) = .602, p = .663$.

Table 3.

Number of patients in group at intake and follow up, and average PHQ-9 depression change scores (i.e. follow-up scores minus initial scores) as a function of initial severity score levels.

PHQ-9 Severity Scores	N at Intake	N at Follow-up	Change Score by Group
No depression (0-4)	N = 8	N = 16	M = -.75, SD = 2.19
Mild Depression (5-9)	N = 10	N = 9	M = -2.5, SD = 6.41
Moderate Depression (10-14)	N = 11	N = 6	M = -4.56, SD = 8.66
Moderately Severe Depression (15-19)	N = 16	N = 8	M = -4.23, SD = 6.04
Severe Depression (20-27)	N = 23	N = 14	M = -2.44, SD = 5.48

A paired-samples t-test indicated that PHQ-9 scores were significantly higher initially ($M = 15.0, SD = 7.17$) than for follow-up ($M = 11.59, SD = 8.66$), $t(53) = 3.66, p = .001$. Participants attended an average of 10.98 ($SD=6.18$) CCT psychology visits each, with over 50% attending fewer than 9, with a mode of 6 visits per person (see Table 5). Of note, a few individuals who complete intake and follow up PHQ-9 attended as many as 30 visits. The age of participants ranged from 18 to 70 years ($M = 25.5, SD = 7.94$). There was a 0.31-point change per visit for the group. Linear regression analyses indicated that the total number of CCT psychology visits was not significantly related to the change in PHQ-9. Neither initial nor follow-up PHQ-9 scores differed significantly by race. There was not a significant difference in PHQ-9 scores for women or men at intake or at follow-up.

Generalized Anxiety Disorder-7 (GAD-7). GAD-7 scores were used to measure patients' anxiety in the CCT clinic. Sixty-eight of the participants engaged with CCT psychology completed an initial GAD-7, and 54 completed a follow up GAD-7. Of those that completed both initial and follow-up scores, 31 individuals had a reduction in GAD-7 scores, 12 increased, and 11 had no change. The majority of patients fell into the severe anxiety descriptive group at intake, followed by moderate and then mild and no anxiety symptoms (see Table 4). The number of patients within the moderate and severe descriptive groups decreased at follow-up while the number of patients within the no anxiety and mild anxiety groups increased. GAD-9 change scores tended to be highest for those with initial depression scores in the severe range, however an analysis of variance indicated that the difference was not significant $F(3, 53) = 2.54, p = .067$.

Table 4.

Number of patients in group at intake and follow up, and average GAD-7 anxiety change scores (i.e. follow-up scores minus initial scores) as a function of initial severity score levels

GAD-7 Severity Scores	N at Intake	N at Follow-up	Change Score by Group
No Anxiety (0-4)	N = 8	N = 16	M = .38, SD = 2.32
Mild Anxiety (5-9)	N = 8	N = 11	M = -2.63, SD = 3.96
Moderate Anxiety (10-14)	N = 15	N = 14	M = -1.80, SD = 5.57
Severe Anxiety (15-21)	N = 23	N = 13	M = -4.96, SD = 5.81

A paired-samples t-test indicated that GAD-7 scores were significantly higher initially ($M = 12.52, SD = 6.72$) than for follow-up ($M = 9.57, SD = 7.31$), $t(53) = 4.03, p = .000$.

Participants attended an average of 10.98 ($SD=6.18$) CCT psychology visits each, with over 50% attending fewer than 9, with a mode of 6 visits per person. A few individuals who complete intake and follow up GAD-7 attended as many as 30 visits. There was a 0.27-point change per visit for the group. Linear regression analyses indicated that the total number of CCT psychology visits was not significantly related to the degree of change on the GAD-7. There was not a significant difference in GAD-7 scores for women or men at intake or at follow-up. There were also no differences by race in initial or follow-up GAD-7 scores.

Table 5.

Means, standard deviations and p-values for GAD-7 and PHQ-9 at intake and follow-up.

	Initial	Post	p-value	Mean # of Visits	Median # of Visits
PHQ – 9 (N=54)	15 (7.17)	11.59 (8.66)	.001	10.98 (6.18)	9
GAD – 7 (N=54)	12.52 (6.72)	9.57 (7.31)	.000	10.98 (6.18)	9

Behavioral health outcomes. For the subset of patients treated for insomnia, chronic pain, and tobacco cessation data specific to these problem areas was collected. However, due to

the limited number of matching intake and follow up data for these measures data analysis was restricted for these variables. The Insomnia Severity Index (ISI) was used to measure insomnia severity in the CCT population. Initial ISI scores were collected for 23 individuals in the groups of CCT patients engaged with Psychology, but follow-up data were collected for only six participants. A paired samples t-test indicated that initial ISI scores were higher ($M = 16.96$, $SD = 7.41$) than for follow-up ($M = 10.33$, $SD = 9.61$), however the difference was not significant $t(5) = 1.73$, $p = .144$.

The Short-form McGill Pain Questionnaire (SF-MPQ) was used to measure intensity of chronic pain in the CCT clinic. Initial SF-MPQ scores were collected for 5 individuals ($M = 24.20$, $SD = 10.33$) with a median score of 25. Follow-up SF-MPQ data were only available for one individual in the CCT group engaged with psychology, therefore no further analyses were conducted. Similarly, there was insufficient data to support an analysis of tobacco usage as well due to the lack of follow up data.

Inpatient Days, Outpatient Specialty, and Emergency Department Utilization

Utilization data on the number of days spent hospitalized inpatient, the number of outpatient specialty visits (e.g. cardiology, pulmonology, etc), and the number of visits to the emergency department were collected and analyzed for the 6 month periods prior to and following CCT intake for the 88 participants who were effectively engaged with CCT psychology. The number of days the CCT psychology patients spent inpatient ranged from 0 to 21 days during the six-month period prior to intake and from 0-28 days for the six-month period following their intake to the clinic, and the data were normally distributed for both time periods. CCT patients engaged with psychology spent an average of 6.45 days inpatient ($N = 88$, $SD = 4.79$) during the six months prior to their intake with the CCT clinic. They spent significantly

more days inpatient ($M = 10.77$, $SD = 6.37$) during the six months after their initiating CCT services, $t(87) = -6.25$, $p = .000$. There was no effect for gender on number of days spent inpatient during either time period.

The number of outpatient specialty appointments ranged from 0 to 3 ($M = .32$, $SD = .687$) prior to CCT intake, and was non-normally distributed with a skewness of 2.32 ($S.E. = .257$) and kurtosis of 4.99 ($S.E. = .508$). Similarly, the number of outpatient specialty appointments ($M = .50$, $SD = .959$) during the 6 months period after CCT intake was non-normally distributed with a skewness of 2.92 ($S.E. = .257$) and kurtosis of 10.27 ($S.E. = .508$). In preparation for analysis the number of outpatient specialty visits was transformed using a log transformation for both time periods. After the transformation the distribution of outpatient specialty visits prior to intake had a skewness of 1.20 ($S.E. = .137$) and kurtosis of .289 ($S.E. = .273$), and during the follow-up period a skewness of 1.24 ($S.E. = .137$) and kurtosis of .764 ($S.E. = .273$). The CCT patients engaged with psychology attended more outpatient specialty visits during the six-month period after engaging with CCT than the six-month period prior to their intake, however this difference approached but did not reach statistical significance, $t(87) = -1.937$, $p = .056$. Results were the same regardless of participants' gender.

During the six months prior to intake into the CCT clinic the 88 patients engaged with psychology made a collective 77 visits to the emergency department ($M = 0.88$, $SD = 1.54$), and 110 visits to the emergency department ($M = 1.25$, $SD = 1.71$) during the six-month period following their intake into the clinic. The number of emergency department visits was non-normally distributed for both time periods with a skewness of 3.18 ($S.E. = .257$) and kurtosis of 12.71 ($S.E. = .508$) for the initial six-month period and a skewness of 1.91 ($S.E. = .257$) and kurtosis of 4.56 ($S.E. = .508$) for the second time period. These variables were transformed

using log transformations to adjust for the non-normal distribution. After the transformation the distribution of emergency visits prior to intake had a skewness of 1.15 (*S.E.* = .257) and kurtosis of .713 (*S.E.* = .508), and during the follow-up period a skewness of 1.24 (*S.E.* = .257) and kurtosis of -.725 (*S.E.* = .508). The increase in utilization of emergency services was significant, $t(87) = -2.178, p = .032$. There was no significant difference in emergency service utilization based on gender or race.

As a comparison tool, the utilization of those not fully engaged with CCT psychology was compared as well (see Table 3). For the 317 patients who were neither fully engaged with CCT psychology or with the CCT clinic as a whole there was no significant difference between their outpatient utilization, $t(316) = -1.301, p = .194$, or emergency room utilization, $t(316) = -1.041, p = .299$, during the six months prior to engagement with CCT and the six months after. Similar to the CCT Psychology group, there was a significant increase the mean number of outpatient specialty visits ($M = .56, SD = .950$), $t(316) = -5.091, p = .000$.

For the 162 patients who were not fully engaged with CCT psychology, but were effectively engaged with the general CCT clinic there were significant increases across inpatient, outpatient, and emergency department utilization. These patients spent 58% more days inpatient, $t(161) = 7.569, p = .000$, had a 53% increase in outpatient specialty visits, $t(161) = -2.615, p = .010$, and a 39% increase in emergency room visits, $t(161) = -2.742, p = .007$. The percentage of increase followed a similar trend in those who were engaged with CCT psychology who had a significant increases of 67% more number days spent inpatient and 42% more emergency room visits, and a non-significant increase of 56% more outpatient visits, with the exact *p*-values listed above. Those least engaged in clinic demonstrated the lowest proportion of increased with a

significant increase of 37% more days spent inpatient, and non-significant increases of 13% more outpatient visits, and 2% more ER visits.

Table 6.

Mean Utilization and Standard Deviations for patients in CCT across level of clinic engagement for CCT psychology patients and general CCT clinic patients.

	N	Inpatient Pre	Inpatient Post	p-value	Outpatient Specialty Pre	Outpatient Specialty Post	p-value	ER Pre	ER Post	p-value
CCT Psychology Engaged	88	6.45 (4.79)	10.77 (6.37)	.000*	.32 (.687)	.50 (.959)	.056	0.88 (1.71)	1.25 (1.54)	.032*
Non CCT Psychology:										
Limited CCT Engaged	317	4.98 (4.62)	6.81 (5.41)	.000*	.56 (.950)	.69 (1.24)	.194	.70 (1.32)	.72 (1.19)	.299
Highly CCT Engaged	162	5.71 (4.97)	9.04 (5.84)	.000*	.38 (.738)	.58 (.888)	.010*	.49 (1.13)	.68 (1.23)	.007*

*significant at the $p < 0.05$ level ; Those not engaged with CCT psychology were divided into two groups based on the their general CCT clinic engagement.

Effects of Distress on Utilization and Physical Health

Analyses were conducted to explore if reductions in psychological distress as measured by the PHQ-9 and GAD-7 were related to lower inpatient utilization and physical health factors. Regression analyses indicated that neither the PHQ-9 or GAD-7 change scores were predictive of outpatient specialty visits or emergency room visits using the log transformed data to adjust for the non-normal distribution of these two variables. The analysis shows that both PHQ-9 ($\beta = .366, p = .006$) and GAD-7 ($\beta = .360, p = .008$) change scores did significantly predict number of days spent inpatient. Specifically, as change scores indicated a reduction in distress, the number of days spent inpatient was lower (see Figure 2).

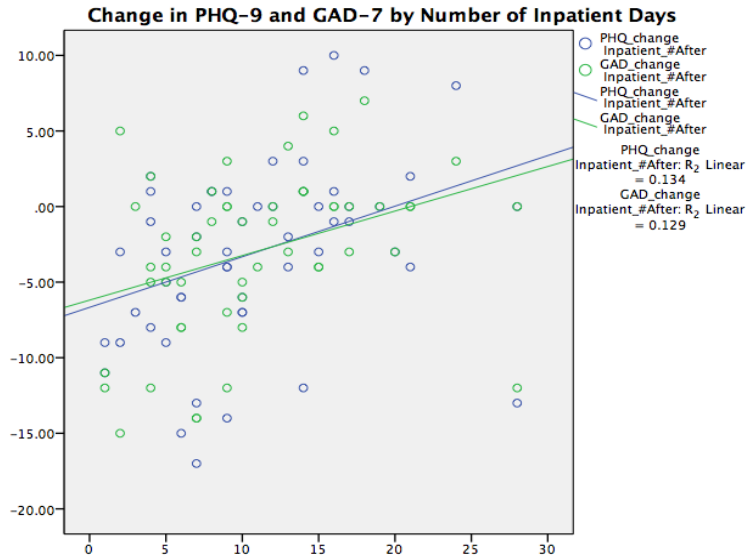


Figure 2. Change in PHQ-9 scores and GAD-7 scores by number of days spent inpatient during the six-month period post CCT intake.

Regression analyses using PHQ-9 intake and recent scores to control for baseline indicated that neither PHQ-9 scores were not predictive of change in HbA1c scores, LDL-C scores, body mass index, or blood pressure. Similarly, when controlling for baseline GAD-7 scores were not predictive of change in HbA1c scores, LDL-C scores, or body mass index. GAD-7 at intake and GAD-7 at follow-up were used in a hierarchical multiple regression analysis controlling for baseline to assess the relationship with the change in blood pressure. A check for multicollinearity indicated the factors have a VIF of 1.917 indicating that the factors are moderately correlated. Results indicated that GAD-7 scores were associated with the change in blood pressure such that a greater change in GAD-7 was related to more improvements in blood pressure for both systolic and diastolic readings.

Table 7.

Multiple regression model controlling for baseline GAD-7 with Systolic Blood Pressure as the dependent variable

Variable	<i>B</i>	<i>SE B</i>	β	<i>p</i>	Total R^2	ΔR^2	<i>p</i>
Change in Systolic Blood Pressure (DV)							
Step 1					.099	.082	.020
GAD intake	-1.42	.593	-.315	.020			
Step 2					.116	.081	.331
GAD intake	-.862	.821	-.191	.299			
GAD recent	-.741	.756	-.179	.331			

The model for systolic blood pressure was statistically significant, $F(1, 52) = 5.726, p < .020$, and accounted for approximately 10% of the variance of change in blood pressure ($R^2 = .099$, Adjusted $R^2 = .082$). The model for diastolic blood pressure was statistically significant as well, $F(1, 52) = 5.083, p < .028$, and accounted for approximately 9% of the variance of change in blood pressure ($R^2 = .089$, Adjusted $R^2 = .072$). The analysis showed that when controlling for baseline GAD-7 was significantly related to the change in systolic blood pressure ($\beta = -.315, t(52) = -2.39, p = .020$) and diastolic blood pressure ($\beta = -.745, t(52) = -2.26, p = .028$) with higher GAD-7 intake scores predicting greater reductions in blood pressure.

Table 8.

Multiple regression model controlling for baseline GAD-7 with Diastolic Blood Pressure as the dependent variable

Variable	<i>B</i>	<i>SE B</i>	β	<i>p</i>	Total R^2	ΔR^2	<i>p</i>
Change in Systolic Blood Pressure (DV)							
Step 1					.089	.072	.028
GAD intake	-.745	.330	-.298	.028			
Step 2					.125	.091	.155
GAD intake	-.293	.453	-.117	.521			
GAD recent	-.602	.417	-.262	.155			

Correlations between PHQ-9, GAD-7, and the change in blood pressure were statistically significant except for the one between PHQ-9 at intake and BP, which was approaching significance (see Table 9).

Table 9.

Pearson Correlations and p-values for GAD-7 and PHQ-9 at intake and follow-up and change in blood pressure.

	<i>Pearson Correlation w/ Blood Pressure</i>	<i>p-value</i>	<i>N</i>
Blood Pressure	1.00	-	54
GAD-7 Intake	-.318	.010	54
GAD-7 Recent	-.287	.018	54
PHQ-9 Intake	-.220	.055	54
PHQ-9 Recent	-.282	.019	54

Supplementary Analyses

Although a true control group was not available, a subset of participants who were engaged with the CCT clinic attended only one brief visit with CCT psychology ($N=91$) allowing for limited supplementary analyses to compare this subset with the patients who were actively engaged with CCT psychology ($N=88$). Utilization data and health outcomes were available for those minimally engaged, however because this subset was not engaged in follow-up with CCT psychology, measures of psychological distress and behavioral health outcomes were not collected or available for analyses.

Utilization. Due to the non-normal distribution of utilization data, the number of outpatient visits, inpatient visits, and emergency room visits were transformed using a log

transformation for both time periods as previously discussed in the primary utilization section. Results of an analysis of variance indicated that there were no significant differences in utilization patterns for outpatient visits, inpatient visits, or emergency room visits between those who attended one visit with psychology and those who were effectively engaged.

Specifically, participants who attended one session with psychology attended an average of .47 ($SD = .794$) specialty outpatient visits during the 6 month period prior to engagement with CCT, and an average of .48 ($SD = .911$) specialty outpatient visits during the 6 month period following initiation of CCT engagement. CCT psychology engaged patients attended at average of .32 ($SD = .687$) outpatient visits during the initial period, and .5 ($SD = .959$) during the second period. While this indicates a different pattern between these two groups with patients engaged, the difference was not statistically significant. In regards to inpatients stays, participants who were minimally involved with psychology initially had a mean of 4.84 days ($SD = 5.453$) which subsequently increase to 8.25 days ($SD = 5.706$) during the second 6 month period as compared the CCT engaged group which initially stayed inpatient for 6.45 days ($SD = 4.794$) which increased to 10.77 days ($SD = 6.36$) which demonstrates an increase for both groups. Additionally, an increase in the number of emergency room visits was seen for both the minimally involved group ($M = .59, SD = 1.247; M = .75, SD = 1.473$) and the effectively engaged group ($M = .88, SD = 1.537; M = 1.25, SD = 1.710$) at each time point respectively.

The minimally involved CCT psychology group and the effectively engaged psychology group did differ in the number of non-psychology CCT visits that they attended, with the more engaged participants attending significantly more visits than those minimally engaged ($t(177) = -6.877, p = .000$). Participants who attended only one CCT psychology visits attended an average of 13.58 ($SD = 9.698$) total non-psychology provider CCT visits, while patients who were fully

engaged with CCT psychology attended a mean of 25.60 ($SD = 13.425$) total non-psychology provider visits.

Health outcomes. Although there were some differences between the participants who attended one psychology visit and those who were more fully engaged in regards to the patterns of changes in body mass index, LDL cholesterol, and HbA1c as noted in Table 7, analyses indicated that none of this variation was statistically significant. There was a significant difference between the groups in regards to blood pressure, $F(1, 177) = 4.016, p = .047$ with the more engaged group showing greater reductions in diastolic blood pressure than the minimally engaged group. Similarly when compared to patients engaged with the CCT clinic overall regardless of involvement with psychology there no significant differences in change in body mass index, LDL cholesterol, HbA1c, or blood pressure.

Table 10.

Mean and Standard Deviation for Pre and Post BMI, LDL-C, and HbA1c outcomes for those minimally engaged versus effectively engaged with CCT Psychology.

	1 Psychology Visit Pre	1 Psychology Visit Post	Engaged Psychology Pre	Engaged Psychology Post
BMI	34.198 (17.42)	33.482 (10.41)	34.622 (16.42)	34.070, (10.16)
LDL	105.22 (39.77)	105.54 (41.46)	120.92 (44.77)	109.1 (40.76)
HbA1c	7.6 (2.37)	7.54 (2.42)	7.46 (2.33)	7.03 (2.23)

*Blood pressure was measured as a categorical variable and therefore not included in this table.

See Figure 1.

Discussion

This study served as an initial evaluation of integrated psychology services in a clinic designed to serve uninsured indigent patients with complex medical concerns and high utilization

histories at the Medical College of Virginia in Richmond, Virginia. The current study evaluates patient outcomes, and more specifically, it further quantifies and describes the specific role that psychologists play in the primary care setting and their impact on utilization of medical care and in improved health outcomes for a unique population of uninsured patients with limited socioeconomic resources. Additionally, the study evaluates psychologists' success at treating mental and behavioral health conditions within the primary care model.

Characteristics of the Sample

There are several notable demographic features in the study population. The overall Complex Care Team population was comprised of nearly an equal split of males and females, with men making up a slightly higher percentage. This was true across levels of participation in the clinic: those who attended no appointments, those who attended fewer than 3 appointments, and those who attended more appointments. However, in contrast there were significantly more women in the group specifically engaged with CCT psychology. Previous research on the segment of patients using the greatest proportion of services has found that being female is a predictor of higher utilization (David & Kaplan, 1995; Green & Pope, 1999). Additionally, prior research has found that men seek psychological help at a lower rate than women, and specifically that women seek treatment for less severe mental illness more often than men, which is consistent with the higher proportion of females in the psychology engaged group in the current study, but the absence of a gender difference in the other levels of utilization (Addis & Mahalik, 2003; Moller-Leimkuhler, 2002).

Other demographic factors including race, ethnicity, marital status and employment status were consistent across the entire CCT population regardless of utilization or engagement with psychology services indicating that none of these factors were predictive of engagement at this

level of care. However, given that the entire CCT population was selected based on their heightened utilization the distribution of these factors in this population was consistent with previous research, and it is not surprising that these factors did not further distinguish differences in utilization.

Specifically, previous research has found that in regards to relationship status heightened utilizers tend to be single, separated or divorced which is consistent with 85.2% of the current study population falling within these three categories, but this is also consistent with their indigent status as well (David & Kaplan, 1995; Green & Pope, 1999). Although, relative to other demographic measures there was more variation in the percentage of married patients across the different levels of CCT engagement, ranging from 8.2% to 18.9%, there was not a clear pattern or significant difference between these groups indicating that relationship status was not predictive of engagement with CCT psychology or whether or not a patient effectively utilized CCT services overall.

Gatchel and Oordt's (2003) findings that disproportionately high utilizers typically have low socioeconomic status and are often unemployed were consistent with less than 15% of the CCT population reporting any current employment and of that portion only 3.4% reporting full-time employment. However, employment status did not distinguish between CCT patients in the general clinic versus those highly engaged with psychology specifically. Of note, although specific financial and socioeconomic information beyond general employment status was not gathered for the purpose of the study, the participants were selected from a clinic serving those who qualify for the Virginia Coordinated Care program, which serves uninsured patients with limited financial resources. As such, it is not surprising that so few of our participants were

employed, and it suggests that even those who are employed full time are facing financial hardship.

Previous research has found racial disparities among recognition of depression and anxiety and referral to psychological treatment in primary care clinics (Stockdale, Lagomasino, Siddique, McGuire, & Miranda, 2008). A recent study conducted within the general primary care clinic at VCU, found a low representation of African Americans within their primary care psychology population (Sadock, Auerbach, Rybarczyk, & Aggarwal, 2014). However, this trend was not represented in the current study in which there was no significant difference in how African Americans or any other racial or ethnic group were represented regardless of their utilization of the clinic or psychology services. Vander Wielen and colleagues (2015) demonstrated that the need for improved access to behavioral health services and primary care for neighborhoods with a high racial and ethnic minority population. The current study describes a clinic that addresses this needs and demonstrate outcomes from targeting at a specific underserved population. African American's appeared to be well represented in the overall clinic sample with 65% of the CCT patients identifying as African American. To give this some context, according to the most recent US Census data in 2010, 51% of Richmond city's population is African American.

In addition to lower rates of detection and treatment referrals for depression and anxiety in African American patients, previous research has also suggested lower rates of care may be related to physician racial bias or poor patient-physician communication (Ashton et al., 2003). Furthermore, Cruz, Pincus, Harman, Reynolds, and Post (2008) found that African Americans reported stigma, shame, and denial as barriers to mental health care. It is possible that the model used in the current study, specifically the routine practice of psychology providers attempting to

make at least brief contact with as many CCT patients as possible regardless of their mental health status may have worked to reduce any stigma or shame about meeting with psychology to address depression and anxiety. This same method of care also is likely to have improved recognition of distress within the CCT primary care clinic overall. Ashton et al. (2003) suggested that another reason African Americans may be unrepresented is due to a preference for fewer services; however, it was noted that this may be do to a lack of awareness of the services available. This barrier to care may also have been alleviated through this model as the availability of psychology services is highly visible in the clinic.

CCT Clinic Engagement

The National Ambulatory Medical Care Survey conducted by the CDC (2015) indicated that in the state of Virginia individuals between the ages of 18 and 64 attended an average of 2.5 ambulatory care visits per year, and those 65 and older attended an average of 6.7 visits per year. By comparison, the participants paneled to the CCT clinic attended over 5 times that average, indicating that this population is indeed comprised of high utilizing patients. Of those in the paneled to the CCT clinic, those who were effectively engaged in the services offered attended over 8.5 times as many ambulatory care appointments as the average adult in Virginia, and those fully engaged with CCT psychology attended over 10 times as many appointments. Previous research has indicated that patients who are high utilizers tend to experience greater psychological distress, which is consistent with the high rate of referrals to psychology seen in our study population and the high utilization rates for those engaged with CCT psychology (Gatchel & Oordt, 2003).

Just over half of the CCT clinic patients attended at least one appointment with psychology indicating that providers were employing the integrated psychology service regularly

and psychology was successfully making contact with the majority of patients seen in the clinic. Most patients who were effectively engaged with CCT services, meaning they attended at least three appointments with 3 different types of providers, attended 2 visits with psychology. Patients engaged with CCT psychology each attended an average of nearly 11 psychology appointments during the study period, and an average of almost 26 appointments each with non-psychology CCT providers indicating that they were utilizing both primary care and psychology services at a high rate. Results indicated that CCT psychology patients utilize both psychology services and other services at a proportionally higher rate. This is consistent with previous research, which has suggested that when patients with chronic illness are treated in integrated clinics they tend to have higher utilization of primary care services, and also with the goal of the VCC program (Woltmann et al., 2012). The purpose of the VCC program is to increase primary care utilization with the goal of improving care of chronic conditions and therefore reducing inpatient and emergency department utilization, so it is expected that primary care services would be utilized to a high degree within this population. Due to limited availability of a comparison group or available information on CCT participants' prior use of ambulatory care, it cannot be established if CCT patients' high utilization of ambulatory care services is a change from their primary care utilization patterns before they were paneled to the clinic.

Health Outcomes

Body Mass Index (BMI). Although not statistically significant, the results of the current study indicated a slight reduction in BMI after engagement with CCT for patients who were effectively engaged with psychology. While conclusions cannot be drawn from the current results, it is possible that significant improvements in BMI may have been achieved over a longer period of follow up. This improvement over time may be suggested as Tang, Funnell,

Brown, and Kurlander (2010) found that in patients with diabetes a weekly psychosocial intervention had improvement in BMI at the 1-year follow-up. However, this change was not demonstrated after 6 months of follow-up. Additionally, it is important to note that BMI was evaluated for all patients engaged with CCT psychology regardless of whether weight management was a focus of intervention. Therefore, it is not possible to distinguish what impact general psychological intervention (for example treatment for depression) had on BMI from the effects of intervention specifically targeted towards weight management. This is a limitation of the current study that could be explored in future work by parceling out which interventions and areas of treatment focus were employed for individual patients.

Hemoglobin A1c (HbA1c). Results of the current study demonstrated significant improvement in HbA1c scores for patients engaged with CCT psychology as compared to their HbA1c when they were seen for their initial visit. HbA1c scores were collected for patients with diabetes on their problem list. While many of these patients received direct intervention for diabetes adherence, patients with diabetes were also seen for a variety of psychological and behavioral health reasons such as depression, anxiety, smoking cessation, etc. The current findings are consistent with previous research, which has indicated improvements in HbA1c for patients who received treatment specifically for diabetes, as well as patients who received treatment for depressive symptoms rather than diabetes adherence directly (Katon et. al, 2010; Egede and Ellis, 2010; Tang, Funnell, Brown, & Kurlander, 2010). Because the intervention was not specified for this population, conclusions about the mechanism of change cannot be drawn, but it is suggested that involvement with psychology in this integrated model of care is an effective adjunct to diabetes management regardless of the intervention focus. It is important to note that due to the lack of a control group, it is possible that other factors such as involvement

with the CCT clinic overall is accounting for some of the improvement in HbA1c rather than involvement with psychology specifically. However, based on the prior body of research evaluating the effects of psychological intervention on HbA1c it is reasonable to consider these findings in support of the favorable impact of psychological intervention on diabetes adherence and health outcomes (Katon et. al, 2010).

Low-density Lipoprotein Cholesterol (LDL-C). This study found LDL-C levels significantly decreased among patients engaged with CCT psychology indicating a reduction in bad cholesterol and an improvement in cardiovascular health as compared to their LDL-C levels at intake to the CCT clinic. This finding is consistent with previous research, which found that patients with cardiovascular disease or diabetes receiving brief psycho-educational intervention showed improved LDL cholesterol after intervention (Katon et. al, 2010). Additionally, Tang, Funnell, Brown, and Kurlander (2010) found that although improvement in LDL-C was not noted after a 6-month psychosocial intervention, improvements were seen after an intensive 6-month treatment program. The current findings suggest that even general involvement within an integrated clinic including brief psychological intervention is effective as well.

Blood pressure. The results of the current study demonstrate a statistically significant reduction in systolic blood pressure as well as in the proportion of patients with Stage 2 hypertension after engagement with CCT psychology. Specifically, over a quarter of the participants engaged with CCT psychology were in Stage 2 hypertension at intake to the CCT clinic, and only 8% of the participants remained in Stage 2 hypertension at their most recent follow-up. While the Stage 1 hypertension and pre-hypertension groups increased, this increase is attributable to improvements in their blood pressure as they shifted from Stage 2 hypertension into a healthier range. Katon et al. (2010) found that in patients with chronic medical illnesses,

systolic blood pressure improved following a psychoeducational intervention, which is consistent with the current results. However, diastolic blood pressure was not reported therefore restricting any direct comparisons to the current study with regard to the stage of hypertension.

International Normalized Ratio (INR). Although partial data were gathered for some participants, there were insufficient INR results to calculate the percentage of scores in range. This serves as an example of a limitation of conducting a study through observation of medical records in a functioning clinic rather than a more tightly controlled design. Due to the importance of adherence to anticoagulation medication, many patients were discontinued from anticoagulation medication treatment if they were non-adherent, resulting in a reduction of data points.

Psychological Distress and Behavioral Health Outcomes

Depression and anxiety. This study found that patients engaged with CCT psychology had significantly lower PHQ-9 scores at follow-up than at intake, which indicated an improvement in depression after CCT psychology intervention. Research by Chung and his colleagues (2013) suggests treatment of depression integrated into medical care improves the effectiveness of overall care. The PHQ-9 findings coupled with the previously discussed improvement in health outcomes indicate that Chung's conclusion is supported by the current study as well. Other research supports these findings over both short and long terms, and although longer follow-up is not available for the current study previous research suggests these outcomes can be maintained over time (Bower et. al, 2006). Additional research projects at a VCU ambulatory clinic demonstrated that patients' depression and anxiety scores were maintained after brief engagement with integrated psychology, and in fact continued to improve

over time (Grinnell, 2014). It is anticipated that future follow-up within the CCT clinic may demonstrate similar long term improvement and maintenance of treatment effects.

Previous research in the VCU ambulatory care clinic found that African American patients did not experience the same reduction in depression ratings on the PHQ-9 following engagement with integrated psychology as Caucasian patients (Sadock, Auerbach, Rybarczyk, & Aggarwal, 2014). However, the current study found no relationship between PHQ-9 improvement and race. Additionally, there was no significant effect for gender on treatment response for depression in the current study.

The results of this study demonstrate a significant decrease in anxiety as measured by GAD-7 scores among patients engaged with CCT psychology. These findings demonstrate that anxious distress can be managed through brief integrated psychotherapy. Similar to the results on the PHQ-9 for depressive symptoms, there was no significant differences in treatment response relative to gender or to race. Although the relationship between depression and anxiety was not specifically evaluated in the current study, previous research suggests that anxiety scores are particularly relevant when treating comorbid depression in primary care settings (Bauer et. al, 2012).

The reduction in overall PHQ-9 and GAD-7 scores occurred over a median number of 9 visits per person, indicating a small reduction per visit. Although this reduction is somewhat lower than the 5 point reduction that has been previously noted as a benchmark for clinically relevant reduction in distress, it is important to note that not all patients completing the PHQ-9 and GAD-7 were necessarily receiving intervention for depression or anxiety specifically (Lowe et al., 2004). Additionally, it should be highlighted that typical appointments in this setting were 20 to 30 minutes in length versus the more traditional model of a 45-50 minute appointment.

At intake more patients were classified as “severely depressed” based on their PHQ-9 score than in any other descriptive range, followed by “moderately depressed.” Although some individuals did have an increase in PHQ-9 and GAD-7 scores over the course of treatment, the majority of patients being engaged with CCT psychology had reductions in their depression and anxiety scores. While the degree of improvement did vary by the patients’ initial distress score, these differences were not significant. However, it is possible that the analysis may have been underpowered and future work could further explore this trend. Specifically, in regards to PHQ-9 depression scores, patients with moderate to moderately-severe symptoms seems to demonstrate greater improvement than those in either the mild or the severe range. For GAD-7 anxiety scores patients in the “severe anxiety range” were observed to have to greatest amount of improvement at roughly double the improvement of patients in the less severe categories. These findings are consistent with previous research in the general ACC clinic at VCU (Sadock, 2014).

Additionally, it has been suggested that treating a greater number of patients in a less intensive setting may be a better population based approach to mental health care (Katon et al., 1997; Katon, 2011; Katon, 2012). Referring all patients with major depressive disorder to traditional mental health treatment may lead to greater individual improvement, however this would also be associated with significantly higher cost and pressure on an already strained mental health system. The ability to make small but meaningful change for a large number of patients through a series of brief visits is a viable alternative for treating many patients that otherwise would have greater difficulty accessing mental health care. Results of the current study suggest that this model of population based mental health care is effective for patients with complex medical and psychosocial stresses and limitations. The fact that depressive illness can be improved through brief intervention for these complex patients with numerous health

concerns is significant as research consistently demonstrates that co-morbid depression negatively impacts health outcomes (Stein et al., 2006).

Behavioral health outcomes. Insomnia, chronic pain, and tobacco cessation are common areas of intervention in integrated health psychology settings. Outcome information such as the number of cigarettes smoked, scores on the Insomnia Severity Index, and on the McGill Pain Questionnaire were collected for a subset of participants at intake that presented with one of these respective problem areas, but analysis of these measures was restricted due to insufficient data points at follow up. Outcome measures were not consistently collected and noted in the medical record. For example ISI scores were initially collected for 23 individuals, but follow up data were recorded in the medical record for only 6 of these patients. Although, the reductions in ISI score were not adequately powered, and therefore not significant they did indicate a downward trend. Future research can expand on these results including a greater number of participants and more stringent follow-up practices to explore this relationship further.

It is possible that when patients noticed improvements on these measures they did not return to CCT psychology treatment, and therefore did not complete follow up measures. Additionally, it may be that intervention for these types of problem areas required less frequent follow up or fewer visits. For example, previous research has demonstrated that brief 1-2 session interventions can effectively treat insomnia (Ellis, Cushing, & Germain, 2015; Funderburk, Shepardson & Krenek, 2015; Wagley, Rybarczyk, Nay, Danish, S., & Lund, 2013). Additionally, a meta-analysis on the use of CBT for Insomnia found that 36% of patients receiving treatment reached remission, which they designated as a score of 8 on the ISI, as compared to 17% in the control groups (Wu, Appleman, Salazar, & Ong, 2015). Because engagement with psychology was defined for the current study as having at least 4 visits with psychology with at least two of

these visits occurring within a one month period of time, it is possible that a greater proportion of patients receiving intervention for these behavioral health issues were excluded due to an increased time period between visits. For example a patient seen once every three weeks for treatment of tobacco cessation or chronic pain may have received sufficient intervention to improve on these measures, but may not have been identified as effectively engaged with psychology for the purposes of this study.

Utilization

Inpatient utilization. In addition to utilizing ambulatory care services, CCT psychology patients utilized inpatient medical services, outpatient specialty services and emergency department services at a high rate relative to their utilization prior to enrollment. The current results demonstrate that despite the expectation that patients engaged with CCT services would have a reduction in their use of inpatient services, the number of days that they spent inpatient increased during the 6 months after their engagement with CCT as compared to the 6 months before. This increase was true whether or not they fully engaged with the CCT clinic overall and whether or not they engaged with CCT psychology specifically. Those engaged with CCT psychology spent more days inpatient on average than those patients not engaged with CCT psychology; however, they also had the highest initial inpatient utilization during the 6 months prior to entering the CCT clinic. Additionally, the rate of increase was highest for patients engaged with CCT psychology with 67% more days spent inpatient as compared to a 58% for patients engaged with CCT services generally but not psychology, and 37% for those neither engaged with psychology or the CCT service as a whole.

Of note, this differs from previous estimates within this population reporting a reduction of costs for inpatient care which might be attributable to the manner in which this variable was

measured. The current study measured inpatient utilization by the number of days spent in patient, while previous estimates were based on the number of inpatient discharges and dollars spent (Virginia Commonwealth University Office of Health Innovation Data and Analysis, 2013). Furthermore, the time frame the data set was collected and compared in the current study differed from the previous analyses. Previous analyses include a pre-period of 15 months, and a post period of 15.5 months; however, the actual time period evaluated was variable for each individual patient. For example in previous analyses, if two months had passed since a patient's initial visit with CCT then their pre-test period was also limited to a two month period of time. Because patients were often paneled to CCT clinic following a costly inpatient or emergency room visit, it is possible that this method of measurement may have influenced the findings that inpatient utilization was initially high and then reduced as the proportion of patients would have been newly assigned to the clinic following a hospital stay and stabilization.

One explanation for this heightened rate of utilization for the CCT psychology group observed in the current study is that these patients had a history of deferred care due their complicated mental and physical health concerns that they required more intensive treatment during their initial 6 months within the CCT program. As they were better able to engage with mental health services and attention was drawn specifically to their health status, it is possible that they became more familiar with using services available to them, and were better able to utilize these medical services and re-engage with the health system.

Other analyses gather for patients within the CCT clinic have demonstrated the clinics super-utilizers or those using the highest level of resources are requiring a greater length of care within the clinic before improvements in utilization are realized (Complex Care Clinic Quarterly Update, 2015). Specifically, these findings indicate that reductions in utilization for this group

are seen after 18 months of follow up within the CCT clinic. While a direct analysis of the current study population was not conducted to determine how many CCT psychology patients are true super-utilizers, it is likely that many of the CCT psychology patients do fall within this group as they exhibited the highest level of utilization across all of the CCT groups.

Emergency department utilization. Similarly to inpatient visits, there was also a significant increase in the number of visits made to the emergency department for CCT psychology patients, and CCT psychology patients had higher initial use of emergency services as well as higher post-time point utilization than the CCT groups not engaged with psychology. CCT psychology patients attended 42% more emergency department visits during the 6 months after they engaged with the CCT psychology than during the 6 months prior to their initial intake appointment. Of the groups not engaged with CCT psychology, only the group engaged with the overall CCT clinic showed a significant increase in emergency department use at a similar rate to the CCT psychology patients with a 39%. This increase was not observed for the majority of CCT patients who were only minimally involved with the clinic, and their use of the emergency department stayed essentially the same. This suggests that compared to inpatient services which significantly increased for all types of CCT patients, that increase utilization of emergency department services may be related to utilization of the CCT clinic services in general but perhaps not to CCT psychology involvement specifically.

As with inpatient utilization, the results of the current study differ from previously analyzed data on the CCT patient utilization which indicated reductions in emergency department expenditures. Although the current results demonstrate that the majority of CCT patients did not have an increase in emergency department utilization, they did not demonstrate a decrease in usage either so this subset would not explain the discrepancy between the prior

results and the current findings. The timeframe of data analyses, and use of actual costs versus visit frequency may attribute to the difference.

With respects to emergency department utilization it is important to consider the reason and level of necessity for the visit. Primary care sensitive diagnoses or ambulatory care sensitive admissions have been previously described as a representation of emergency department utilization that could be addressed through outpatient primary care services (Schreiber & Zielinski, 1997). Freund et al. (2013) found that these potentially avoidable hospital visits typically fall into one of five categories. These factors included 1) medical system problems such as a lack of access or availability of outpatient primary care services, 2) physician related problems including poor monitoring of patients' health status, 3) medically related factors such as negative side effects of medications, 4) patients related factors such poor adherence and delayed help seeking, and 5) social factors such as a lack of social support or the opposite, overprotective caretakers. While these factors have all been designated as leading to avoidable admissions and areas of improvement, it was also noted that patients with multiple co-morbidities such as those seen in the CCT clinic are more prone to medical emergencies and complication resulting in a greater number of unavoidable admissions (Freund et al., 2013).

It has been suggested that by improving access to better outpatient services these preventable emergency department costs could be reduced (Alqatari, Morgan, Chang, & Pines, 2012). However, previous research has demonstrated that for the highest cost patients this strategy is likely not sufficient (Joynt, Gawande, Orav, & Jha, 2013). In an evaluation of high-cost Medicare patient utilization, Joynt and colleagues (2013) found that in areas with higher primary care supply, there was higher preventable utilization for high cost patients. They suggest that while investing in improved primary care services is important, the cost savings for

these strategies will likely be measured in years rather than weeks or months. These findings support the possibility that with a longer range of follow-up reductions in emergency department care may be seen within the CCT population as well.

Previous research has also demonstrated that high-cost patients are not demonstrating a higher percentage of primary care preventable emergency department visits than lower cost patients (Liu et al., 2012; Joynt, Gawande, Orav, & Jha, 2013). Additionally, for high-cost utilizers, Liu and colleagues (2012) found that frequent emergency department utilizers had higher rates of mental health and alcohol related visits than lower frequency utilizers. Information on the nature of the emergency room visit was not collected for the current study, but future work can expand on this data set and re-evaluate the results within that context. Further analyses of the data for the present study could determine what percentage of these visits are attributable to primary care sensitive diagnoses, and also to mental health. With a narrowed view it may be possible to see what impact integrated psychology can have on visits related to mental health concerns specifically.

Outpatient specialty utilization. Findings related to utilization of outpatient specialty visits indicated no significant increase in utilization for patients engaged with CCT psychology. Similarly, there was not a significant increase for patients who were engaged with the CCT clinic overall in a limited fashion; however, patients highly engaged with the overall CCT clinic, but not with psychology were observed to have a significant increase in their utilization of outpatient specialty services. This group had a 53% increase in the number of outpatient specialty visits during the 6 months post-CCT engagement relative to the 6 months prior. The CCT psychology group had a similar increase of 56%, however this difference was not statistically significant for this smaller group.

The increase in outpatient utilization may be attributable to the patients re-engaging with the health system and catching up on care that has been previously deferred. As patients attend more CCT visits, they are becoming more familiar with using and navigating medical services. Engagement with the CCT clinic and with CCT psychology brings an awareness and attention to issues of adherence that may lead to an increase in referrals to other outpatient providers resulting in an increase in utilization. However, mental health concerns may have continued to be a barrier for CCT psychology patients.

Effects of Distress on Utilization and Physical Health

Although outpatient specialty visits and emergency room visits were not significantly related to reductions in psychological distress, PHQ-9 and GAD-7 change scores were related to reductions in the number of days spent inpatient during the 6 months after intake. Previous work evaluating utilization in the context of mental health and substance use has found that only anxiety disorders are consistently associated with increased utilization (Ford, Trestman, Tennen, & Allen, 2005). Although the current findings suggest that change scores for both PHQ-9 and GAD-7 were related to reductions in inpatient utilization, it is important to note that the two are highly correlated to each other. Furthermore, although patients completed the GAD-7 and PHQ-9, depression or anxiety disorders may not have been the specific target area of treatment. Additionally, a general regression to the mean may also account for the reduction in inpatient utilization for this group. Future work could expand on the current data set by evaluating which particular interventions patients were receiving and exploring the relationship between specific target areas and outcomes.

With regard to physical health, GAD-7 scores at intake were found to be particularly predictive of blood pressure change. Higher GAD-7 intake scores predicted greater reductions in

blood pressure. GAD-7 and PHQ-9 scores at follow up were found to have a lesser but still statistically significant correlation with change in blood pressure. These results seem to support prior research on the negative impact anxiety has on a patient's physical functioning, and suggests that for patients with particularly high blood pressure a referral to psychology to address anxiety may be especially beneficial to this subset of patients (Beard, Weisberg, & Keller, 2010).

Supplementary Analyses

One limitation of the current study is the lack of a randomized comparison control group. Although not every patient was seen by the psychology service, due to the nature of how the clinic functioned, psychologists made an effort to make contact with as many patients as possible. However, record of contact for brief interactions was not always documented or available in the scheduling record. Therefore it can not be assumed that a patient identified as not attending an appointment with psychology had zero interaction with psychology as they likely had one brief interaction at some point during their CCT engagement. While this flexibility improved patients' access to care, and the ability of psychology to integrate with other providers in a more seamless fashion, it is a limitation in regards to research in this population. To address this limitation, outcomes for patients who attended just 1 brief interaction with psychology were compared with those identified as effectively engaged meaning they attended at least 4 visits with two occurring within a one-month period.

Utilization. Patients who attended only one session with CCT psychology demonstrated no significant differences in number of outpatient, inpatient, or emergency room visits from patients who were engaged with CCT psychology. Neither group demonstrated an increase in outpatient visits, and both groups were found to have an increase in days spent inpatient as well as in emergency room visits. These findings may suggest that even limited interaction with

psychology results in similar patterns of utilization, or that over a period of 6-months factors other than involvement with CCT psychology are contributing to the changes, specifically the increases in utilization. These results are consistent with Badamgarav's (2003) findings on increased utilization among patients receiving collaborative care. Consistent with the current findings, the previous research found statistically significant improvements in depression symptoms, patient satisfaction with care, adherence to their treatment regimen, and detection of depression. However, Badamgarav et al.'s (2003) findings related to health care costs and utilization indicated this model was associated with higher costs and increased utilization.

Health outcomes. Patients who were effectively engaged with CCT psychology were found to have significantly greater reductions in diastolic blood pressure than were those patients who only attended one psychology visit. There was no significant difference between these groups in regard to body mass index, LDL cholesterol, or HbA1c. Similarly, there were no significant differences between the overall CCT engaged group with any level of interaction with psychology and the CCT psychology group on these measures. It is likely that the overall group was quite similar to the group that had documented attendance of one visit as many in the overall group may have had similar involvement that was undocumented. It is possible some of the difference between the groups is related to anxiety as the GAD-7 intake score was significantly predictive of blood pressure change, but caution should be used in making this interpretation as the specific relationship between anxiety and blood pressure was not explored for these groups, and intervention and problem area of focus is not available for these individuals. Further research is necessary to investigate the mechanism of change influencing how the presence of integrated psychology in a primary care clinic effects health outcomes as these results suggests

the changes may not be due specifically to the number and frequency of visits as measured in this study.

The similar health improvements for those involved with psychology in a limited fashion as compared to those highly involved suggest the possibility that even brief interaction with psychology may have a positive impact on health outcomes or that another factor such as overall involvement with the integrated clinic is the driving force behind the improvement. The difference in improvements in blood pressure for patients highly engaged with psychology rather than those engaged to a lesser degree taken with the relationship of anxiety with reductions in blood pressure and anxiety and reduced utilization suggests that further exploration of the role of anxiety specifically is warranted.

Summary of Key Findings

Integrating behavioral health and primary care as a form of population based mental health is an important area of advancement for care of low income minorities and super-utilizers, but implanting these strategies can be difficult in practice (Dickinson, 2015; Green & Cifuentes, 2015; Vander Wielen et al., 2015). The present study demonstrated that integrated psychology services were effectively utilized within an ambulatory care clinic for a unique segment of uninsured indigent patients with complex medical and psychosocial needs. Psychology providers were successful at making at least some brief contact with a large portion of the patients who were effectively engaged with the clinic and provided more in depth service to 16% of patients paneled to the clinic.

The key findings of this study include significant increases in utilization and significant improvements in health outcome scores for those who were engaged with CCT psychology. Specifically, a significant increase in days spent inpatient was found among those participants

who were engaged with CCT psychology after initiating CCT services. Utilization of emergency services also increased significantly for this group. Of note, similar increases in inpatient utilization were observed for the overall CCT clinic regardless of their level of engagement within in the clinic. Additionally, increases in emergency room utilization was found for patients engaged with the overall CCT clinic, but no significant difference in emergency services was observed for those with limited engagement with CCT psychology. Although both those engaged with CCT psychology and those engaged with the CCT clinic as whole demonstrated increased in utilization of outpatient specialty services this increase was only significant for the group that was not highly engaged with psychology indicated that mental health concerns may have continued to be a barrier to accessing specialty medical services.

With respects to utilization, the patients referred to and highly engaged with CCT psychology had the highest initial and follow up utilization across inpatient stays and emergency department visits. This supports previous research which has demonstrated that mental health concerns significantly impact patients' physical health and utilization of medical services. The significant increase in utilization among patients engaged with CCT psychology may have been influenced by those patients' mental health conditions as their utilization tended to increase at a higher proportion for inpatient and emergency room visits. It is possible this group deferred seeking treatment for physical conditions before they received psychological care. Low adherence to treatment is also commonly seen among patients suffering from depression and anxiety, which may offer some explanation as to why increases in outpatient specialty utilization was not significant for those in CCT psychology, but was for those highly engaged with CCT who were not seen for mental health needs. Although conclusions of the current study are limited

by the lack of an available control group, the utilization patterns observed within this group suggest that this is an important subset of complex patients to continue exploring.

Improvements in health outcomes for CCT psychology patients included significant reductions in HbA1c and LDL-C scores. The proportion of these patients with higher hypertension scores was also significantly reduced following engagement with CCT psychology. It is possible that these reductions are due to overall engagement with CCT clinic as a whole, and further exploration of these findings would benefit from the inclusion of a control group. However, these findings demonstrate that patients with comorbid mental health concerns can be effectively cared for within integrated clinics.

Analysis showed significant changes in scores on mental health measures as well. PHQ-9 scores of those engaged with CCT psychology were significantly lower at follow-up, as were GAD-7 scores for the same group. PHQ-9 and GAD-7 change scores are both significantly related to number of days spent inpatient. As these scores decreased, the days spent inpatient was lower. Additionally, this study found GAD-7 scores at intake to be the best single predictor of significant change in blood pressure, though PHQ-9 and GAD-7 scores at follow-up also significantly predicted blood pressure change. Higher GAD-7 intake scores predicted greater reductions in blood pressure. Change, and specifically reductions, in blood pressure among patients engaged with CCT psychology was found to be significantly greater than change in blood pressure among patients who attended only one psychology visit. These findings suggest that anxiety in particular may be an important target area, particularly for patients with cardiovascular disease.

In summary, the present study demonstrates that patients with complex medical and mental health needs can be effectively managed and treated in an integrated ambulatory care

clinic. Care within this clinic resulted in significant improvements in depression, anxiety, HbA1c, cholesterol, and blood pressure. The findings suggested possible improvements in behavioral health outcomes such as insomnia as well, but more structured follow-up data are needed in future research to explore this relationship. Additionally it is possible that reductions in BMI may be significant if followed over a longer period of time.

Utilization outcomes were more mixed, and contrary to the expectation that integrated services and improvements in health would be related to decreased utilization due to improvements in care and also regression to the mean. Given the shift in health outcomes over, it is possible that early increases in utilization at the six month mark, may shift to reductions in utilization and cost if the window of observation is expanded.

Future Directions

The current study demonstrates that patients with complex medical concerns and co-morbid mental health needs are utilizing medical services at the highest rate when compared to other high utilizers. Given the demands that this increased utilization places on the healthcare system this specific population is an important area of future research. While the current study demonstrated improvements in both mental and physical health outcomes for this population, future research comparing the role of integrated psychology with a control group is needed.

Given the findings that utilization increases within 6 months of engagement with the integrated clinic, research incorporating longer terms outcomes is necessary to explore if the early improvements in health outcomes will translate to reductions in utilization overtime. Additionally, the inclusion of information on the nature of the emergency department and inpatient admissions and whether these services were primary care specific and preventable should be incorporated into future work. Finally, given the particular significance of anxiety as

it relates to blood pressure and inpatient utilization observed in this study future work elaborating and targeting these aspects in particular may be a promising area of research.

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Appendix A

1. Primary Care Psychology Clinic Intervention Categories for Notes
2. Participant Demographic and Basic Medical Information
3. Generalized Anxiety Disorder-7 (GAD-7)
4. Patient Health Questionnaire-9 (PHQ-9)
5. Short-form McGill Pain Questionnaire (SF-MPQ)
6. Insomnia Severity Index (ISI)

Primary Care Psychology Clinic

Intervention Categories for Notes

Brief Consults (No Active Intervention)

- Introduction of Services
- Psychoeducation
- Supportive Counseling
- Self-Monitoring
- Referral
- Safety Plan

Intervention Types (General)

- Goal Setting
- Problem-Solving
- Relaxation
- Values Clarification

Intervention Types (Mental Health)

- Cognitive Therapy
- Graded Exposure
- Interpersonal Intervention
- Behavioral Activation
- Assertiveness

Intervention Types (Behavioral Health)

- Motivational Enhancement
- Activity Pacing
- Urge Surfing
- Sleep Hygiene
- Stimulus Control
- Sleep Restriction

Participant Demographics and Basic Medical Information

Age: _____

Gender (Circle one): Male Female

Marital Status (Circle one): Married Single Divorced/Widowed

Ethnicity (Circle one): White, not Hispanic Black, not Hispanic Hispanic/Black
Hispanic, White American Indian/Alaskan Asian
Pacific Islander Unknown/Other

Height: _____ feet _____ inches

Weight: _____ lbs (Intake to CCT)
_____ lbs (most recent CCT Psyc)

BMI: _____ (Intake to CCT)

BMI: _____ (most recent CCT Psyc)

A1c: _____ (Intake to CCT)

A1c: _____ (most recent CCT)

Cholesterol: _____ (Intake to CCT)

Cholesterol: _____ (most recent CCT)

INR %: _____ (Intake to CCT)

INR %: _____ (most recent CCT)

Blood Pressure: _____ (Intake to CCT)

Blood Pressure: _____ (most recent CCT)

Current health conditions:

- 1) _____
- 2) _____
- 3) _____
- 4) _____

- 5) _____
- 6) _____
- 7) _____
- 8) _____

Current mental health conditions:

- 1) _____
- 2) _____

- 3) _____
- 4) _____

VCC Code: _____

Employment Status: Full Time Part Time Unemployed Disabled Retired

Seeking Disability: Yes No

GAD-7

Over the last 2 weeks, how often have you been bothered by the following problems? <i>(Use "X" to indicate your answer)</i>	Not at all	Several Days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worry	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

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

Not difficult at all

Somewhat difficult

Very difficult

Extremely difficult

PHQ-9

Over the last 2 weeks, how often have you been bothered by any of the following problems? <i>(Use "X" to indicate your answer)</i>	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

2. If you checked off any problem on this questionnaire so far, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people? (PLEASE CIRCLE)

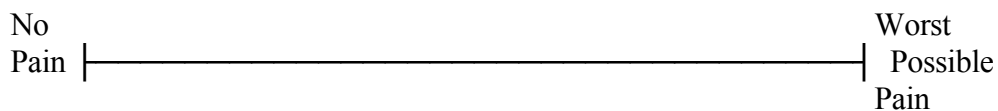
Not difficult at all Somewhat difficult Very difficult Extremely difficult

SHORT-FORM MCGILL PAIN QUESTIONNAIRE

Please choose the words below that describe your pain *today*. If a word does not describe your pain, choose the 0 (*none*) for that word. For each word that does describe your pain, rate the intensity for that quality of your pain from 1 (*mild*) to 3 (*severe*).

	<u>None</u>	<u>Mild</u>	<u>Moderate</u>	<u>Severe</u>
Throbbing	0) _____	1) _____	2) _____	3) _____
Shooting	0) _____	1) _____	2) _____	3) _____
Stabbing	0) _____	1) _____	2) _____	3) _____
Sharp	0) _____	1) _____	2) _____	3) _____
Cramping	0) _____	1) _____	2) _____	3) _____
Gnawing	0) _____	1) _____	2) _____	3) _____
Hot-burning	0) _____	1) _____	2) _____	3) _____
Aching	0) _____	1) _____	2) _____	3) _____
Heavy	0) _____	1) _____	2) _____	3) _____
Tender	0) _____	1) _____	2) _____	3) _____
Splitting	0) _____	1) _____	2) _____	3) _____
Tiring-exhausting	0) _____	1) _____	2) _____	3) _____
Sickening	0) _____	1) _____	2) _____	3) _____
Fearful	0) _____	1) _____	2) _____	3) _____
Punishing-cruel	0) _____	1) _____	2) _____	3) _____

Rate the intensity of your pain on the two scales below. Make a mark on the line to indicate where your pain falls between *No Pain* and *Worst Possible Pain* and then circle the appropriate number on the second scale.



- 0 No pain
- 1 Mild
- 2 Discomforting
- 3 Distressing
- 4 Horrible
- 5 Excruciating

Insomnia Severity Index

The Insomnia Severity Index has seven questions. The seven answers are added up to get a total score. When you have your total score, look at the 'Guidelines for Scoring/Interpretation' below to see where your sleep difficulty fits.

For each question, please **CIRCLE** the number that best describes your answer.

Please rate the *CURRENT* (i.e. *LAST 2 WEEKS*) *SEVERITY* of your insomnia problem(s).

Insomnia Problem	None	Mild	Moderate	Severe	Very Severe
1. Difficulty falling asleep	0	1	2	3	4
2. Difficulty staying asleep	0	1	2	3	4
3. Problems waking up too early	0	1	2	3	4

4. How **SATISFIED/DISSATISFIED** are you with your **CURRENT** sleep pattern?

Very Satisfied	Satisfied	Moderately Satisfied	Dissatisfied	Very Dissatisfied
0	1	2	3	4

5. How **NOTICEABLE** to others do you think your sleep problem is in terms of impairing the quality of your life?

Not at all Noticeable	A Little	Somewhat	Much	Very Much Noticeable
0	1	2	3	4

6. How **WORRIED/DISTRESSED** are you about your current sleep problem?

Not at all Worried	A Little	Somewhat	Much	Very Much Worried
0	1	2	3	4

7. To what extent do you consider your sleep problem to **INTERFERE** with your daily functioning (e.g. daytime fatigue, mood, ability to function at work/daily chores, concentration, memory, mood, etc.) **CURRENTLY**?

Not at all Interfering	A Little	Somewhat	Much	Very Much Interfering
0	1	2	3	4

Guidelines for Scoring/Interpretation:

Add the scores for all seven items (questions 1 + 2 + 3 + 4 + 5 + 6 + 7) = _____ your total score

Total score categories:

0–7 = No clinically significant insomnia

8–14 = Subthreshold insomnia

15–21 = Clinical insomnia (moderate severity)

22–28 = Clinical insomnia (severe)

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Vita

Danielle Christina Worthington was born on December 5, 1982, in Sacramento, California, and is an American citizen. She graduated from high school at Grace Academy, Chattanooga, Tennessee in 2001. She received her Bachelor of Science in Biology, Bachelor of Science in Psychology, and Bachelor of Arts in Studio Art from Virginia Polytechnic Institute and State University, Blacksburg, Virginia in 2005. She received a Master of Arts in Psychology with an emphasis in Neuroscience from University of Richmond in 2008.