2014

The Impact of a Primary Care Psychology Training Program on Medical Utilization in a Community Sample

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THE IMPACT OF A PRIMARY CARE PSYCHOLOGY TRAINING PROGRAM ON
MEDICAL UTILIZATION IN A COMMUNITY SAMPLE

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science
at Virginia Commonwealth University

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July, 2014

Acknowledgement

I would like to thank my advisor, Dr. Bruce Rybarczyk, for his encouragement throughout this process and for his mentorship over the course of my graduate training so far. I would also like to thank the other members of my thesis committee, Drs. Stephen Auerbach and Arpita Aggarwal, for their helpful feedback and guidance. I also owe thanks to Dr. Marshall Crumiller for his assistance in talking through the data and results. Finally, I am grateful for the love and support of my family and friends.

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Abstract

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By Autumn Marie Lanoye, B.A.

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Mental illness and psychological distress is associated with higher rates of medical service usage and treatment of these issues results in more appropriate medical utilization rates. Little research has been conducted in an integrated care clinic, wherein health psychologists or behavioral health specialists work together with physicians to provide patient care. The current study examines the effects of brief behavioral and mental health interventions on patient medical utilization in this setting with care delivered by medical residents and doctoral psychology trainees. Access to the health system's electronic billing records allowed for objective measures of annual healthcare utilization in terms of inpatient, outpatient, and emergency department use. A quasi-control group was constructed using propensity score matching in order to compare patients who had received a primary care psychology intervention to those who had not. Rates of inpatient utilization decreased significantly among treated patients overall as well as among treated patients identified as frequent attenders; there was no change in inpatient utilization

among patients in the control group overall nor among frequent attenders in the control group, indicating that there is likely an effect of behavioral and mental health treatment on rates of inpatient visits. Rates of emergency department use and specialty outpatient visits were comparable between treated and control group patients, suggesting the lack of a treatment effect in these areas. Strengths, limitations, possible mechanisms, and implications for future research are discussed.

The Impact of a Primary Care Psychology Training Program on Medical Utilization in a

Community Sample

Increased healthcare expenditures in the United States have prompted researchers across a variety of disciplines to develop strategies for reducing medical costs. Analyses of healthcare spending indicate that a significant percentage of these costs represent money wasted on inefficient care. These inefficiencies exist both on the supply side, with physicians requesting unnecessary treatments, tests, and procedures, as well as on the demand side, due to inappropriate medical resource use by patients. Clinical health psychologists have the potential to contribute to the amelioration of healthcare costs on both sides of this equation, while simultaneously improving patient care. Decades of research has established a strong link between mental health status and healthcare utilization in that mental illness and psychological distress is associated with higher rates of medical service usage. More recently, investigators have explored the possibility that treatment of these psychosocial issues might result in a more appropriate medical utilization rate. An integrated care model, wherein mental and physical health issues are treated concomitantly by an interdisciplinary medical team, has demonstrated preliminary effectiveness in terms of more efficient patient care and reductions of unnecessary medical utilization. Importantly, these beneficial economic effects are achieved at no cost to quality of care for the patient.

The current study explored the effects of brief behavioral health interventions on patient healthcare utilization in a training hospital. The Primary Care Clinic (PCC) at this hospital represents an integrated approach to healthcare in that there are in-house mental health services provided by graduate students in clinical psychology, who work in tandem with primary care physicians in order to address patient psychosocial issues and behaviors that pose a threat to

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successful medical intervention. Based on previous research, it was expected that patients who were seen by primary care psychology in this setting will demonstrate a subsequent decrease in their utilization of high-cost healthcare resources compared to a control group of patients who were not seen by psychology. The hospital's centralized electronic records and billing database provide an opportunity to collect objective, retrospective data regarding patient hospitalizations, medical specialty appointments, and routine visits. The current study has the potential to make a meaningful contribution to the literature because the effects of psychological treatment on medical utilization have not yet been examined in a training setting wherein patients are treated by medical residents and clinical psychology graduate students in a safety-net clinic.

Medical Utilization Costs

The rising cost of healthcare in America is a source of growing concern for medical professionals, health policymakers, and the public at large. Between 1980 and 2010, U.S. healthcare expenditures multiplied tenfold – from $256 billion to $2.6 trillion – corresponding to an 8% increase relative to total GDP (Centers for Medicare and Medicaid Services, 2012). Several factors likely contribute to this growth in spending: medical technologies have become more advanced and thus more expensive; additionally, we are developing effective treatments for medical conditions, enabling people to live longer lives. Furthermore, rises in the rates of chronic health conditions like obesity contribute to a subsequent rise in healthcare costs. In 2008, the costs attributed to the medical treatment of obesity alone were estimated at $147 billion (Finkelstein, Trogdon, Cohen, & Dietz, 2009). Despite this surge in spending, the general health of Americans is far poorer than that of other countries that devote much less of their budget to healthcare. Sweden, for instance, has a lower infant mortality rate than the U.S. (2.5 compared to 6.1 per 1,000 live births) and a higher average life expectancy (80.88 compared to 77.97), despite

spending only 9.6% of their GDP (compared to America's 17.6%) on healthcare costs (Organisation for Economic Co-operation and Development, 2012).

One possible explanation for this poor return on investment is that some significant percentage of this expenditure is wasted. The administrator of the Centers for Medicare and Medicaid Services, Donald Berwick, estimated that waste might account for up to 30% of healthcare spending in the United States (Pear, 2011). A report by the Institute of Medicine priced wasteful healthcare spending at $765 billion annually, with the costs of inefficient service delivery estimated at $130 billion and missed prevention opportunities at $55 billion (2012). These findings are highlighted by the American Medical Association, whose suggestions for addressing the problem of wasteful spending include reducing the burden of preventable disease and moving toward more efficient healthcare delivery (2012).

The Role of Clinical Health Psychologists in Mitigating Excessive Healthcare Spending

Both of these recommendations represent areas in which clinical health psychologists and behavioral medicine specialists might contribute to waste reduction efforts. In 2009, the leading causes of death in America were heart disease, cancer, and chronic lower respiratory disease – all of which have behavioral risk factors such as diet, exercise, and tobacco use (Centers for Disease Control, 2012). Behavior modification approaches to reducing rates of preventable disease include promoting improvements in medication compliance, nutrition, and physical activity, as well as decreasing risk behaviors such as substance use. Behavioral health interventions have demonstrated effectiveness with regard to preventable chronic illness in a variety of domains. The Diabetes Prevention Program, for example, found that a lifestyle intervention was more effective in preventing the onset of Type 2 diabetes than was a regimen of the diabetes medication metformin (Diabetes Prevention Program Research Group, 2002). With respect to

cardiovascular disease, a multicenter randomized control trial found that a Mediterranean diet high in olive oil, nuts, fresh fruits and vegetables, fish, and white meat was associated with a 30% reduced risk of cardiovascular events (heart attack or stroke) when compared to a standard low-fat control diet (Estruch et al., 2013).

Recognizing the need to move toward more efficient care for patients, researchers in health psychology have also spearheaded the development and testing of stepped-care treatment models, wherein the recommended level of care is matched to patient need. Donovan and Marlatt described the process of stepped-care decision-making as follows: "the least costly, least intensive, and least restrictive treatment judged to be sufficient to meet the person's needs and goals should be attempted initially before more costly and restrictive treatments are attempted" (1993, p. 401). In many cases, the treatments requiring the least expense and intensity are behavioral in nature, and can sometimes even be self-guided by the patients themselves – thus presenting the potential to save the healthcare system valuable resources. An insomnia complaint in primary care might result in a prescription medication or a referral to a sleep specialist, both of which are expensive and decrease patient autonomy. Mack and Rybarczyk (2011) recommend that the treatment for chronic insomnia should begin with self-help cognitive behavioral therapy for insomnia (CBT-I). If that treatment is ineffective, the patient would proceed through increasing levels of intensive treatment – manualized group CBT-I, brief individual CBT-I, and finally referral to a specialty sleep clinic – until an appropriate treatment is found. In an environment with limited resources, stepped-care models present an evidence-based opportunity to divide services among patients.

Gatchel and Oordt (2003) propose that psychologists in the health and behavioral medicine field can also contribute to reductions in medical spending by assisting with research

efforts and treatment outcome analyses. The tracking of treatment outcomes will become increasingly important as the field moves toward placing a greater emphasis on effective and efficient patient care; however, most physicians do not have sufficient training in this area to fully carry out this policy change. Psychologists, on the other hand, have more extensive training in psychometrics, program evaluation, data collection, and statistics in addition to a strong background in evidence-based treatments. This skillset represents a valuable contribution to a healthcare team that prioritizes efficient quality care.

Individual Determinants of Healthcare Utilization

Turning to the demand side of healthcare also presents a number of opportunities for reduction in wasteful practices. Healthcare consumers might seek inappropriate or unnecessary services for a number of reasons, a phenomenon which has been examined in research across a multitude of academic fields. A common example of inappropriate medical use by patients is the non-emergent use of the emergency department, which results in not only excessive costs, but also the potential for decreased quality of care due to overcrowding and strain on staff. A number of factors might be at play in these cases, including socio-economic status, health insurance status, patient perception of illness severity, access to primary care services, and perceived convenience (Rocovich & Patel, 2012). These and other examples illustrate that it is not solely objective illness severity that determines a patient's decision to seek medical treatment. Berkanovic, Telesky, and Reeder (1981) provide evidence to support this observation, finding that need factors explained only between 12 and 25 percent of the variance in a model predicting medical utilization. In the same analyses, the authors found that social influences and individual symptom-specific beliefs accounted for significantly more variance in medical utilization, thus highlighting the importance of social and attitudinal factors when investigating individuals'

decisions to seek care. In order to further explore possible individual factors that might predict or explain healthcare utilization, a number of approaches have been proposed.

Andersen and Newman (1973), for instance, developed a behavioral model of healthcare utilization in which three sequential factors predict the volume of medical resources consumed by an individual. Predisposing factors are individual characteristics that exist regardless of illness onset, such as age, sex, education, and attitudes toward healthcare use. Higher rates of healthcare utilization have been found to be associated with being female (Cleary, Mechanic, & Greenley, 1982), older age, and white, non-Hispanic racial/ethnic background (Bernstein et al., 2003). Enabling factors are those that provide the means to utilize healthcare services should the individual choose to do so, e.g. health insurance status, income, and perceived accessibility of healthcare resources. Lastly, need factors are the most immediate cause for medical utilization and include both perceived and physician-evaluated illness level. All three of these factors must be taken into consideration, as none of them in isolation is sufficient to fully predict healthcare use.

Lynch and Vickery (1993) outlined four specific components of healthcare demand, and argue that all of these factors should be considered when healthcare utilization and demand management are considered. In this conceptualization, Andersen and Newman's need factor is split into two separate categories: objective need (morbidity) and perceived need, further highlighting that these are two separate constructs. These authors also emphasize the role of patient preference in terms of treatment options, but acknowledge that these preferences are likely influenced by supply factors such as physician advice, technological capabilities of healthcare facilities, and insurance regulations. Lastly, Lynch and Vickery discuss possible nonhealth motives for medical help-seeking behavior, of which the patient may or may not be

aware. This category introduces the importance of considering secondary gain factors (external motivations to use healthcare resources), malingering (deliberate exaggeration or fabrication of medical symptoms), and the tendency toward moral hazard, or risk-taking knowing that one will not personally incur the cost (Donaldson & Gerard, 1989).

Focusing specifically on psychological determinants of medical utilization, Friedman, Sobel, Myers, Caudill, and Benson (1995) identified six possibly pathways for this relationship. The first of these is information and decision-support, in that patients base their decision to seek care in part based on their knowledge of their symptoms, the medical system, and available services. This is of interest particularly when thinking about overuse or misuse of medical services, as medical bills are typically sent to third-party payers and thus patients may be unaware of the costs of healthcare (O'Donohue, Ferguson, & Cummings, 2001). Lack of knowledge about psychological issues such as panic attacks or anxiety might also lead patients to interpret their symptoms in a biomedical problem and seek help at a primary care clinic or emergency department.

The second pathway outlined by Friedman and colleagues is the psychophysiological pathway, which highlights the role that stress plays in illness onset and course. Basic psychoneuroimmunology research reveals evidence for this proposed pathway in that chronic heightened stress is associated with poorer immunological functioning and greater incidence of illness (Cohen, Tyrrell, & Smith, 1991). Stress has been implicated in causing physiological changes that are associated with greater risk for cardiovascular disease, more rapid HIV progression, and growth and metastasis of certain cancers (Cohen, Janicki-Deverts, & Miller, 2007). Some of the relationship between psychological distress and higher rates of medical utilization is likely due to this direct relationship between stress and disease. As discussed above,

however, Andersen and Newman's behavioral model of healthcare utilization indicates that need factors (i.e. higher rates of illness and greater illness severity) alone are not sufficient to explain all the variation in medical utilization.

Third, the behavior change pathway emphasizes the impact that behaviors such as substance abuse, diet, and physical activity have on health outcomes. The role of these behaviors in terms of chronic illness and leading causes of death in America has already been explicated above, but it is important to note the psychological purpose that they might serve. Research demonstrates than an increase in unhealthy behaviors is often a response to stress in the face of inadequate healthy coping mechanisms. Stress lowers our ability to engage in self-regulation, making these unhealthy habits particularly tempting even in the face of a previous successful reduction of these behaviors (Glass, Singer, & Friedman, 1969). In addition, some of these unhealthy behaviors, such as the consumption of high-calorie foods or tobacco use, have mood-elevating properties, reinforcing their use as a stress-reduction tool (Garg, Wansink, & Inman, 2007; Kenford et al., 2002).

Social support is another proposed pathway to healthcare utilization, and Friedman and colleagues suggest that patients may use interactions with the healthcare system as a way to alleviate feelings of isolation. Social support has long been linked to positive health outcomes, higher perceived quality of life, and longevity (e.g. Kaplan, Cassel, & Gore, 1977; Cohen & Wills, 1985). In an examination of the association between social support and healthcare utilization, Broadhead and colleagues (1989) found that patients with lower perceived emotional support had significantly higher rates of outpatient medical utilization than did patients with higher perceived emotional support. There was no differential utilization effect in terms of structural social support (e.g. number of social contacts, group membership and participation),

indicating that a perceived lack of emotional support or understanding, rather than an inadequately-sized social network, accounted for this increase in medical service use.

Friedman and colleagues also discuss the role of undiagnosed psychological problems such as anxiety and depression. These psychiatric conditions sometimes have associated physical symptoms, which might result in patients presenting to their primary care providers rather than a mental health professional. This problem is exacerbated by the finding that mental health is rarely assessed for or managed adequately in a primary care setting (Katon, 1984). As such, a visit for anxiety might result in unnecessary referrals to specialists or testing, increasing medical utilization and expenditures. The prevalence of mental illness in medical settings and their role in increasing rates of healthcare utilization will be discussed in more detail below.

Lastly, somatization represents an intersection of mental and physical health that likely results in increased medical utilization, as these patients are highly sensitive to perceived bodily changes. The somaticizing patient is one who experiences psychosocial stress in terms of physical symptoms which are then attributed to a medical condition in need of treatment (Lipowski, 1998). The DSM-III introduced a new category of somatoform disorders which share as their main diagnostic feature the presence of physical symptoms in the absence of a medical explanation for these. These diagnoses include somatization disorder, characterized by generalized pain, gastrointestinal distress, sexual dysfunction, and apparent neurological symptoms; conversion disorder, characterized by medically unexplained neurological impairments or deficits; and hypochondriasis, marked by excessive fears of disease or illness due to the misinterpretation and amplification of physical symptoms (American Psychiatric Association, 2000). Prevalence rates of somatization vary, from less than 1% in the general population, to approximately 6% in medical settings (Kirmayer & Robbins, 1991). Barsky, Orav,

and Bates (2005) determined that somaticizing patients consumed medical resources (both inpatient and outpatient) at a rate nearly twice that of non-somaticizing patients. This finding retained significance even after the authors controlled for the presence of mental health and medical comorbidity. In relation to primary medical complaints at outpatient physician visits, Sobel (2000) estimated that 60% of these have no organic basis.

Mental Health and Medical Utilization

With so many psychological pathways to healthcare utilization, it is no surprise that decades of research have evinced many instances in which both broadband distress and specific mental illnesses are associated with increased medical utilization. Collins (2009) estimated that 70% of all primary care visits are driven by psychological rather than physiological factors. Manning and Wells (1992) found that among the general population, worse mental health (assessed both in terms of psychological distress and psychological well-being) was associated with higher rates of inpatient and outpatient medical use, even after controlling for physical health status. Cohen and colleagues (2010) found that, after objective illness level, a mental health diagnosis was the strongest predictor of high rates of medical utilization. This relationship between mental and physical health is bidirectional, in that mental health issues are a risk factor for certain physical health conditions, just as physical health problems are a risk factor for the development or exacerbation of mental illness (Goldberg, 2010). The mental health conditions most strongly associated with increased healthcare utilization are adjustment issues (i.e. trouble coping with chronic stressors), anxiety disorders, mood disorders, and substance use disorders (Chiles, Lambert, & Hatch, 1999).

Psychosocial stress. Tessler and colleagues (1976) examined the relationship between several indicators of psychological distress and healthcare utilization in a prospective study of

patients in a multispecialty physician practice. In baseline interviews with 327 patients, the authors assessed psychological distress (stress level, life worries, neuroticism, negative affect, emotional discomfort), attitudes toward healthcare (perceived locus of control, skepticism toward medical care, propensity to seek help), and perceived health status. In the year following these interviews, the authors collected objective utilization data from patients' medical charts. In analyzing these data, Tessler and colleagues found that psychological distress remained a significant predictor of medical utilization even after controlling for demographic variables, attitudes toward healthcare, and health status.

Bereavement has also been linked to increased medical utilization. In a comprehensive study of those who had lost their spouses to cancer, Guldin, Jensen, Zachariae, and Vedsted (2013) found that healthcare utilization of the surviving spouse spiked soon after the loss, and remained high for months or years afterwards. Compared to patients in a control group, bereaved patients demonstrated an increase in primary care outpatient visits as well as after-hours or acute care outpatient visits, longer hospital stays, and higher rates of anxiolytic, sedative, and antidepressant prescriptions. Dorn and colleagues (2006) found that bereavement following loss due to a natural disaster similarly predicted a higher rate of primary care utilization, and in particular, an increased rate of contacting primary care physicians with mental health complaints when compared to a control group.

Anxiety. Of the anxiety disorders, panic disorder is the most researched with respect to its impact on medical utilization, as many of its symptoms are known to be physical in nature. In a survey among patients meeting criteria for panic attacks, Katerndahl and Realini (1995) found that 85% of those seeking treatment for panic for the first time did so in medical rather than psychiatric settings. Patients presenting to their physician's office or even to the emergency

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department with symptoms such as shortness of breath, increased heart rate, chest pain, and dizziness might undergo extensive and expensive testing to rule out medical causes (Katon, 1996). Comparisons of panic disorder patients to matched controls indicate that those with panic disorder had higher medical utilization rates with respect to primary care visits (Simpson et al., 1994), emergency room visits (Barsky et al., 1999), and ambulance use (Katerndahl & Realini, 1995).

Panic attacks also occur outside of panic disorder, however, and are common in many other types of anxiety disorders. Furthermore, other anxiety disorders such as phobias and post-traumatic stress disorder also have physiological symptoms. To explore medical utilization patterns across a wider range of anxiety disorders, Marciniak, Lage, Landbloom, Dunayevich, and Bowman (2004) collected utilization, demographic, and diagnostic data from a nationwide insurance billing database. When compared to a non-anxiety control group matched on age and sex, the anxiety group demonstrated higher rates of utilization, higher medical costs, and higher costs associated with absence from work and decreased productivity. Individuals in the anxiety group had significantly more specialty outpatient visits, more emergency room visits, and longer hospital stays than those in the control group. In an analysis of differences between anxiety disorders in terms of associated medical costs, Marciniak and colleagues (2005) found post-traumatic stress disorder to be more costly than both generalized anxiety disorder and panic disorder.

Depression. Depression is common among patients in primary care, with prevalence rates in the United States averaging around 10% or more (Egede, 2007). Research evidence suggests that depressed patients in this setting use more healthcare resources than non-depressed patients. Widmer and Cadoret (1978) found that in the months leading up to a diagnosis of

depression, patients initiated more primary care office visits and were hospitalized more often than patients in a non-depressed control group. This increased use of medical resources has been found to continue in the years after a diagnosis of depression as well. Katon, Berg, Robins, and Risse (1986) found that depressed patients had more physician visits, more medical evaluations, and made more telephone calls to their physician in the year after a depression diagnosis than did a control group of non-depressed patients. Unfortunately, however, depression is typically mismanaged in a primary care setting, indicating that this increase in utilization is not necessarily associated with increased quality of life or reduced depressive symptomatology for patients (Katon, 1984).

This link between depression and physical health complaints becomes even more pronounced among the elderly and those who are chronically ill. Depression in the elderly is associated with inflated medical costs in a number of areas including excess disability, reliance on residential care facilities, and faster rate of disease progression (Katz, 1996). Furthermore, the disproportionately high rates of suicide among the elderly are attributable almost exclusively to depression (Conwell et al., 1991; Lyness, Conwell, & Nelson, 1992). Rates of depression among the chronically ill – including those with diabetes, cardiovascular disease, and COPD – are almost three times higher than among the general population (Egede, 2007). Depression in this population can not only lead to a shorter life expectancy, but also decrease overall quality of life in patients' remaining years (Goldberg, 2010).

Substance use disorders. Substance abuse and dependence are especially important to this discussion because they have direct effects on medical utilization rates in that these behaviors are risk factors for health conditions such as cancer, stroke, liver disease, and respiratory disease (National Institute on Drug Abuse, n.d.). In addition, intoxication may lead to

accidental injuries requiring medical assistance (Macdonald, Wells, Giesbrecht, & Cherpitel, 1999). Direct health care costs in America due to substance use were estimated at more than $216 billion in 2005 – this figure does not include indirect costs such as lost earnings or those associated with the legal system (National Center on Addiction and Substance Abuse, 2009). While the prevention and treatment of substance use disorders would certainly reduce these healthcare costs, the above data does not necessarily represent a misuse or waste of medical resources. In other words, there are health consequences of substance use that warrant legitimate increases in medical utilization compared to the overall population.

Again, however, we find that this increased objective need for medical treatment does not completely account for the relationship between substance use and higher rates of healthcare utilization. Rush (1989) found that patients who abused alcohol presented in primary care with psychosocial complaints (e.g. marital and social problems) at significantly higher rates than did a control group of patients. Patients with substance use disorders have also been found to make more visits to the emergency room for vague, non-specific medical complaints than patients without substance use disorders (French, McGeary, Chitwood, & McCoy, 2000). Inappropriate drug-seeking behavior also contributes to inflated rates of medical utilization among substance users. An emergency department seeing 75,000 patients per year is estimated to have 262 visits each month from patients who fabricate or exaggerate symptoms in order to receive prescription medications – typically opioids (Hansen, 2005).

Frequent Attenders

Applying these broad findings regarding the association between psychological factors and increased medical utilization to an individual patient creates a portrait of the "frequent attender." This term and others (e.g. "heartsink," "dysphoric," "problem patients," "the worried

well") refer to the subset of individual healthcare seekers who use a disproportionately large percentage of medical resources. Frequent attenders are often a source of frustration for physicians because they represent a strain on the healthcare system and are sometimes perceived as demanding, complaining, dissatisfied, and non-compliant (Gatchel & Oordt, 2003). In a qualitative examination of frequent attendance, Hodgson, Smith, Brown, and Dowrick (2005) found that on one hand, these patients were dissatisfied with the treatment they received (e.g. "they don't understand," "they can't find out what's wrong with me"), but on the other, they viewed their physician as an authority figure and a source of reassurance (e.g. "you can tell them anything," "they know what they're doing"). Interestingly, the patients in this study were relatively unaware of the frequency with which they sought medical treatment.

The profile of a frequent attender is not limited to a specific set of characteristics, and research demonstrates that this category comprises a heterogeneous group of patients (Jiwa, 2000). There are, however, several factors associated with frequent attendance – many of which have already been discussed above (e.g. somatoform disorders, psychological distress, anxiety disorders). In a meta-analysis of studies investigating frequent attendance, Gill and Sharpe (1999) found that these patients were more likely to be female, elderly, and of lower socioeconomic status. In addition, frequent attenders often presented with a primary complaint that was psychosomatic or psychosocial in nature, but also had high rates of comorbid medical and psychological illness (Gill & Sharpe, 1999). Other relevant psychological variables associated with frequent attendance include poorer subjective evaluation of their health (Borgquist et al., 1993), beliefs that their symptoms are abnormal (Sensky, MacLeod, & Rigby, 1996), external locus of control (Murray & Corney, 1989), and negative affect (Robinson & Granfield, 1986).

Effects of Mental Health Treatment on Healthcare Utilization

This documented association between mental health concerns and increased rates of medical utilization raises the question of whether mental health treatments could reduce excessive healthcare utilization, thus decreasing overall medical costs. This hypothesis is known as the medical cost offset effect – wherein the cost of providing a treatment now is offset by a reduction in medical expenses down the road (Cummings, Kahn, & Sparkman, 1962). For example, the cost of a preventive vaccine might be "paid for" by avoiding costs associated with treating the disease in the future. In the mid-20th century, researchers began investigating whether a similar medical cost offset could be effected by psychosocial interventions. O'Donohue, Ferguson, and Cummings (2001, p. 13) state the question as the following: "Can the cost of detecting and treating patients' psychosocial problems (from subclinical problems such as stress, to mental disorders such as depression, to adjunctive problems such as treatment adherence, or finally, lifestyle issues such as poor exercise habits) be offset by decreased medical utilization in the future?"

Findings. The first attempts to answer this question empirically were spearheaded by Cummings and colleagues beginning in the 1960s. Cummings' early research revealed several important findings and sparked decades of further research in this area. In a landmark 1967 study, Follette and Cummings examined the utilization patterns of patients in a group medical practice before and after they began outpatient psychotherapy. When compared to a control group matched on psychological distress and baseline utilization, patients who received mental health treatment subsequently consumed both inpatient and outpatient healthcare resources at lower rates. These reductions were sustained over a follow-up period of five years after

psychological treatment ended. Furthermore, brief (eight sessions or less) rather than long-term

therapy demonstrated the greatest impact in overall reduction of medical utilization.

Meta-analyses further delineate the conclusions we can draw from this now plentiful

body of research. The first, conducted by Mumford, Schlesinger, Glass, Patrick, and Cuerdon

(1984), analyzed the results of 58 studies investigating the role of mental health treatment in the

medical cost offset phenomenon. Of the studies selected for inclusion, 85% reported a significant

reduction in medical utilization following some type of psychological intervention. Taking study

design into account, the authors found the average reduction in medical utilization across

naturalistic studies to be 33.1%. Across experimental studies, however, the average reduction

appears to be lower, averaging 10.4%. This highlights a potential self-selection bias that might

be remedied only by conducting randomized controlled trials. In addition to these general

conclusions, Mumford and colleagues discovered two other points of note: first, that the effect of

therapy has a larger impact on inpatient rather than outpatient utilization reduction, and second,

that the offset effect is more pronounced in older patients (age 55 or above).

More recently, Chiles, Lambert, and Hatch (1999) conducted an updated meta-analysis

examining 91 studies, including those from the original Mumford and colleagues study, which

allowed for a more nuanced look at what types of treatments might be most effective. Chiles and

colleagues conducted analyses looking for differential impact on cost offset effects in terms of

treatment settings, treatment types, and therapist characteristics. The authors reported a

moderately significant effect with respect to treatment settings, presenting preliminary support

for Mumford and colleague's finding that the medical cost offset effect is stronger in an inpatient

rather than outpatient setting. They also found that, while both psychotherapy and behavioral

medicine treatment approaches produced a medical cost offset effect, this effect was larger in

studies relying upon a behavioral medicine intervention. Lastly, in examining differences between treatment provider type (psychologist versus psychiatrist), Chiles and colleagues found no significant difference in offset effect, and both provider types were associated with a reduction in medical utilization.

Mechanisms of change. Early investigations into the ways in which the cost-offset phenomenon was effected implicated patient insight, a commonly proposed mechanism of psychotherapeutic change, as a mechanism in this relationship as well (Mechanic, 1981; Wertlieb, Budman, Demby, & Randall, 1982). To that end, Budman, Demby, and Feldstein (1984) conducted qualitative interviews with patients following their treatment in a cost-offset study. The authors asked these patients about the degree to which they themselves noticed a decrease in their medical utilization following their receipt of mental health treatment. Analyses of the resultant data did not indicate a significant relationship between insight and post-intervention medical utilization, however, indicating that this is not a likely mechanism by which the medical cost-offset effect is produced.

More recently, Friedman and colleagues (1995) proposed that their six psychological pathways to medical care were also six pathways by which interventions could work to produce a cost offset effect. Behavioral health interventions that target the information and decision-support pathway, for example, have been successful in reducing rates of medical utilization by promoting patient self-efficacy and competence through psychoeducation, self-management, and self-help skills (Robinson, Schwartz, Magwene, Krengel, & Tamburello, 1989; Lorig, Mazonson, & Holman, 1993). Though mechanisms for this pathway have not yet been empirically tested, Friedman and colleagues proposed that these information-based interventions empower patients to take personal responsibility for their healthcare. Biofeedback and relaxation

target the psychophysiological pathway, as evidenced by the findings of Shellenberger, Turner, Green, and Cooney (1986), who reported that patients assigned to a stress management intervention demonstrated a significant reduction in healthcare utilization at two-year follow-up when compared to controls, who demonstrated an increased rate of utilization.

More traditional psychological interventions, too, have produced a cost-offset effect for patients with high rates of utilization. Pallak and colleagues (1995) found that in a randomized control trial with frequent attenders, brief psychological treatment targeting emotional distress resulted in decreased utilization rates and lower medical costs. Screening and treatment of psychiatric conditions in a sample of inpatients was associated with decreased length of hospital stay in a study by Strain and colleagues (1991). Psychotherapeutic interventions in a group setting have also demonstrated effectiveness, and have the potential to be even more cost effective (Hellman, Budd, Borysenko, McClelland, & Benson, 1990). These types of interventions target the social support, undiagnosed, psychiatric problems, and somatization pathways (Friedman et al., 1995).

Medical offset in primary care. Interventions conducted by behavioral health specialists in a primary care setting have the potential to address excessive medical utilization in terms of both supply and demand. With respect to supply factors, as previously discussed, clinical health psychologists continue to develop brief, low-intensity psychosocial and lifestyle interventions aimed at changing health behaviors and reducing distress. In addition, clinical health psychologists might also be able to produce indirect benefits including saving physician time, which is already a limited resource, and reducing physician frustration and stress (Gouge, 2013).

In working with the demand side of the issue, clinical health psychologists are able to address patient psychological concerns that have driven them to a medical setting. Integrated

care can help to reduce barriers to patients' receipt of mental health treatment by the presence of psychologists as part of their typical healthcare team. Integrated care also has the benefit of co-location, eliminating the gap between physician and mental health referral, resulting in improved patient follow-through (10% in traditional primary care compared to 85-90% in integrated care [Cummings, O'Donohue, & Cummings, 2009]). The offset effect in a primary care setting has been found to reduce medical costs by 20-30% above and beyond the cost of the behavioral or mental health care for high utilizers (Cummings et al., 2003).

Limitations. While it is generally accepted that mental health treatment produces a cost offset effect, less is known about the details of this phenomenon due to several common methodological flaws common in this burgeoning field. Many early studies did not include a control or comparison group, and so in these cases, reductions in medical utilization might be due either to the intervention or may simply represent regression to the mean. Constructing an appropriate control group, however, raises additional methodological issues in that we do not yet know all of the relevant variables on which to match patients. Previous research indicates that patient age, gender, baseline utilization, and level of psychological distress should be taken into account. In addition, studies that rely upon retrospective patient self-report might suffer from subjective recall bias, especially in this population. Studies of frequent attenders indicate that they are often unable to accurately describe their frequency of medical utilization (Budman et al., 1984; Hodgson et al., 2005). In general, there remains a lack of clarity in this area with respect to the types of treatment provided (i.e. whether these are empirically-supported interventions), making it difficult to both discern mechanisms of change and to attempt replication (O'Donohue, Ferguson, & Cummings, 2001).

Statement of the Problem

Research has demonstrated that integrated care models and behavioral health interventions have the potential to contribute to the amelioration of wasteful medical spending by reducing unnecessary or inappropriate medical utilization. However, little is known about the impact of these interventions on utilization outside of carefully designed randomized control trials, which do not always translate perfectly into real-world settings. A retrospective study in the context of a primary care psychology clinic operating as it normally does would provide an opportunity to evaluate the effectiveness of integrated care in terms of reducing medical utilization.

Current Study

The proposed study has the potential to make a meaningful contribution to the above-described body of literature in that it is the first examination of the medical cost offset effect in an integrated care clinic wherein healthcare providers are trainees in either medicine or psychology (with a focus on behavioral medicine). Reduced rates of medical utilization in this setting would imply a great potential for an offset effect in that the costs associated with healthcare provided by students in a training hospital is lower than those associated with more experienced clinicians. This study also addresses common methodological flaws in similar previous studies by including a control group matched on relevant characteristics, as well as by collecting objective data from medical charts.

The purpose of the proposed study is to evaluate the potential for a primary care psychology training program (PCPTP) to impact the medical utilization of patients in a community primary care clinic. A decrease in utilization of high-cost services such as emergency room visits, inpatient stays, and specialty outpatient appointments following receipt of primary

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care psychology services might indicate that PCPTPs are helpful in terms of reducing wasteful healthcare utilization and promoting efficient use of medical resources. It is also important to monitor potential under-utilization of necessary resources, and so the proposed study will also assess frequency of routine visits to the PCC before and after patients are seen by the PCPTP, which are expected to remain relatively stable. In addition, due to the importance of frequent attenders in terms of resource burden and physician stress, the current study will also assess the impact of the PCPTP on the healthcare utilization of this subset of patients. It is expected that decreases in service utilization will be most drastic among these patients, as they likely have the greatest levels of distress. Lastly, the incremental effectiveness of the PCPTP in reducing medical utilization will be examined, comparing patients who have been seen by the PCPTP for just one or two visits to those who have been seen three or more times.

Hypotheses. The following hypotheses are proposed for the current study:

Hypothesis 1. In the year following their visit to the PCPTP, PCC patients will demonstrate statistically significant decreases in their frequency of

        1a. Emergency room visits

        1b. Inpatient stays

        1c. Outpatient specialty visits

Hypothesis 2. PCC patients who are not seen by the PCPTP will remain stable in their annual utilization of

        2a. Emergency room visits

        2b. Inpatient stays

        2c. Outpatient specialty visits

Hypothesis 3. Frequency of outpatient PCC visits will remain stable across time among both patients who have been seen by the PCPTP and those who have not.

Hypothesis 4. Among patients who have been seen by the PCPTP, the medical utilization reduction of frequent attenders (at or above the 90th percentile in terms of total utilization) will be significantly greater than that of those who are not frequent attenders in terms of

4a. Emergency room visits

4b. Inpatient stays

4c. Outpatient specialty visits

Hypothesis 5. Among patients who have been seen by the PCPTP, those who have had three or more visits will demonstrate greater utilization decreases than those who have had one or two visits with respect to

5a. Emergency room visits

5b. Inpatient stays

5c. Outpatient specialty visits

Hypothesis 6. Among patients who have been seen by the PCPTP, reductions in depression and anxiety will be significantly associated with reductions in utilization with respect to

6a. Emergency room visits

6b. Inpatient stays

6c. Outpatient specialty visits

Method

Procedure

  Setting. The Primary Care Clinic (PCC) is an outpatient general internal medicine
facility housed within a teaching hospital (VCU Hospital System; VCUHS). Patients are seen for
a broad range of medical services by resident physicians who provide patient care under the
supervision and guidance of faculty attending physicians. The various medical departments
throughout the wider hospital system are connected via an electronic medical records and billing
system, which allows for greater continuity of care and comprehensive patient management.
Patient demographic data, chart notes, prescription history, and appointment records are all
accessible via this centralized system.

  In December 2008, the primary care psychology program was instituted at the PCC. The
structure of this program mirrors the existing medical resident training program in that graduate
students in psychology provide patient care under the supervision of licensed clinical
psychologists. Graduate students who participate in this training program have demonstrated a
clinical interest in adult behavioral medicine, and have received specialized training to that end.
Areas of care cover both behavioral medicine and mental health issues, and include depression,
anxiety, chronic stress, insomnia, weight management, and treatment adherence. Interventions
provided for these conditions vary, but all are based on empirically supported treatments. A
recent analysis of the effectiveness of the primary care psychology program demonstrated
significant reductions in patient scores on depression and anxiety measures, in addition to
positive weight loss and smoking outcomes (Sadock, Auerbach, Rybarczyk, & Aggarwal, 2014).

  Primary medical and behavioral medicine services in the PCC are provided according to
an integrated care model wherein physician and psychologist trainees collaborate to optimize

patient care. Both primary care and behavioral medicine providers use the same office space for their center of operations, which facilitates not only patient care, but multi-disciplinary training opportunities: medical residents can ask for a psychological perspective on a particular patient and vice versa. Physicians can also request that behavioral medicine trainees see their patients for a same-day appointment – a practice known as the "warm handoff."

Data collection and cleaning. Medical service utilization data for participants were collected based on billing code data collected from the hospital medical records system. First, the billing code database was searched for the Medical Record Numbers (MRNs) of all PCC patients who were seen by primary care psychology at least once between December 2008 and December 2011. Their demographic and utilization data were collected from this same database. For patients who have seen primary care psychology only once, their utilization data was collected for the calendar year before and after that one and only visit. For patients who have seen primary care psychology twice, their utilization data will be collected for the calendar year before and after the date of their second visit. For patients who have seen primary care psychology three or more times, the date of the third visit will be used to generate data for the "pre" and "post" year utilization. This process yielded 923 patients, whose data comprise Sample 1.

A second sample of patient was compiled in order to create a matched control group; patients in this sample were not seen by primary care psychology providers. A search through the same database was performed for all patients seen in the PCC within one year of June 1, 2010 (the median date of the time span used to collect data for the previous sample). Their PCC visit date nearest to June 1, 2010 was used as an "index date" from which to generate "pre" and "post" utilization data. Patients treated by primary care psychology were eliminated from the returned results. This process yielded 1063 patients, whose data comprise Sample 2.

Cases from both samples were removed from the database if there was insufficient data (i.e. if they had not been seen both before and after their index visit), resulting in a Sample 1 *N* of 822 and a Sample 2 *N* of 999.

Propensity score matching. Due to the retrospective nature of the data, control and treatment groups were not determined by random assignment. In order to create an appropriate comparison group, propensity score matching (Rosenbaum & Rubin, 1983) was used to generate one-to-one matches between patients in each sample. Propensity score matching takes into account multiple covariates simultaneously, creating a singular, scalar variable that can be used in the creation of a matched control group. Matching a patient in the control group with a patient in the treatment group can approximate random assignment, thus creating a quasi-experimental design.

The procedure used in the current study followed the "nearest available matching with calipers defined by the propensity score" method outlined by D'Agostino (1998): First, both treatment and control patients were compiled into one database and randomly ordered. Next, propensity score software was run through SPSS using age, race, insurance status, and total baseline healthcare utilization as covariates, producing a propensity score for each patient. A caliper was calculated based on the recommendations of Rosenbaum & Rubin (1983): a quarter of a standard deviation of the logit of the propensity score. The matching procedure selects the first treated patient and matches it to the untreated patient with the closest propensity score within the predefined caliper range. This process is repeated until all possible matches have been made.

Measures

        Demographics. Patient age, gender, race, and health insurance status are collected as part of routine care and recorded in electronic medical charts. Patient medical and billing information are linked by MRN, and thus demographic data was easily imported for patients in the database. For the purposes of matching, race and health insurance status were dummy coded; racial/ethnic categories were American Indian or Alaskan Native, Asian, Black, Hawaiian or Pacific Islander, Hispanic, White, Other, and Unknown. Health insurance was categorized as Medicare, Medicaid, VCC/Indigent care, and Other.

        Utilization data. Medical utilization was measured before and after behavioral health intervention (before and after the index visit date in the control group) in terms of frequencies according to the following service categories:

        Total utilization. Number of visits to any VCUHS department, including inpatient visits, outpatient visits, and emergency department use.

        Inpatient visits. Number of times that the patient was admitted as an inpatient. Routes to admission may vary in that not every inpatient visit is the result of emergency department use.

        Emergency department use. Patient use of the emergency department use will be counted in two ways. The first is total number of visits to the emergency department, regardless of follow-up care (e.g. patient may either be admitted as an inpatient, transferred to an outpatient department, or discharged). The second is the number of emergency room visits *not including* visits for which the patient was subsequently admitted as an inpatient or outpatient. This latter value is an approximation of emergency department misuse.

        Outpatient visits. Number of visits the patient had in the VCUHS on an outpatient basis, including both primary care and specialty appointments.

Primary care visits. Number of primary care appointments attended by the patient.

Specialty visits. Number of specialty outpatient visits attended by the patient (e.g. dermatology, urology, etc.).

Depression. Depression is assessed at each patient visit to the PCPTP using the Patient Health Questionnaire Module 9 (PHQ-9), a 10-item self-report questionnaire (Kroenke, Spitzer, & Williams, 2001). Scores range from 0-27, with higher scores indicating more severe symptoms of depression. The PHQ-9 is a commonly-used instrument in primary care settings and demonstrates strong psychometric properties in both clinical and research contexts (Kroenke et al., 2001).

Anxiety. Anxiety is assessed at each patient visit to the PCPTP using the Generalized Anxiety Disorder Seven-Item Scale (GAD-7), a brief self-report measure (Spitzer, Kroenke, Williams, & Lowe, 2006). Scores range from 0-21, with higher scores indicating more severe symptoms of anxiety. The GAD-7 is a commonly-used instrument in primary care settings and demonstrates strong psychometric properties in both clinical and research contexts (Spitzer et al., 2006).

Participants

Table 1 displays demographics for patients across Sample 1 and Sample 2 ($N = 1821$). Overall, patients seen in the PCC are predominantly female (62.5%), black (63.8%), and insured by either Medicare or indigent care, with an average age of 55.7. Patients seen by a psychology provider were younger on average, and more likely to be white and insured by Medicaid or indigent care than patients in the control group. The utilization breakdown for patients across both samples is seen in Table 2; as expected, these data were significantly positively skewed – thus, the medians and inter-quartile ranges are displayed.

Table 1

Patient Demographics (Unmatched Sample)

	Sample 1 (seen by psychology) N = 822		Sample 2 (control group) N = 999		Total N = 1821	
	N (%)	Mean (SD)	N (%)	Mean (SD)	N (%)	Mean (SD)
Age		51.4 (13.4)		59.2 (14.4)		55.7 (14.5)
Sex						
Male	326 (39.7)		356 (35.6)		682 (37.5)	
Female	496 (60.3)		643 (64.3)		1139 (62.5)	
Race						
Black	482 (58.6)		680 (68.1)		1162 (63.8)	
White	323 (39.3)		298 (29.8)		621 (34.1)	
Asian	0 (0.0)		6 (0.6)		6 (0.3)	
Hispanic	11 (1.3)		0 (0.0)		11 (0.6)	
Pacific Islander	1 (0.1)		0 (0.0)		1 (0.1)	
Am. Indian	2 (0.2)		0 (0.0)		2 (0.1)	
Other	3 (0.4)		15 (1.5)		18 (1.0)	
Insurance						
Medicare	281 (34.2)		490 (49.0)		771 (42.3)	
Medicaid	160 (19.5)		119 (11.9)		279 (15.3)	
Indigent/VCC	315 (38.3)		295 (29.5)		610 (33.5)	
Other	66 (8.0)		95 (9.5)		161 (8.8)	

Proposed Analyses

In order to test the hypotheses assessing change in utilization patterns over time (H1-H3),

Wilcoxon signed-rank tests will be performed separately in each sample of patients (treated v.

control). The selected analysis is a non-parametric test due to the presumably skewed distribution

of frequencies for these utilization variables. The Wilcoxon signed-rank test is the non-

parametric alternative to a paired *t*-test, which can be used to determine whether repeated-

measures means are statistically different.

Hypothesis 4 predicts that frequent attenders (high utilizers of medical care) will exhibit a

significantly greater decrease in their medical utilization (inpatient, specialty outpatient, and

emergency department visits) following their treatment by primary care psychology. First,

frequent attenders will be identified in this sample by selecting those patients whose total

utilization for the year prior to behavioral medicine treatment was at or above the 90th percentile

compared to the overall sample. Next, depending on the distribution of this data, either an

independent samples *t*-test or a Mann-Whitney *U*-test will be performed. Both tests are used to

determine whether between-group means are significantly different, but unlike a *t*-test, the *U*-test

does not assume that the data is normally distributed. If these analyses yield significant results, a

second propensity score matching procedure will be conducted in order to determine whether

these effects are unique to treated patients.

The penultimate set of hypotheses concern the incremental effectiveness of behavioral

medicine treatment in this setting. These hypotheses will be tested in the treatment group alone.

These patients will be divided on the basis of number of visits to primary care psychology, with

patients seen one to two times in the first subsample, and patients seen three or more times in the

second. To determine whether patients who were seen three or more times had greater utilization

reductions than patients who were seen less than three times, either an independent samples *t*-test or a Mann-Whitney *U*-test will be performed. Again, this decision will be made based on the nature of the data distribution as described above.

Lastly, a significant association between reductions in mental health symptoms (depression and anxiety scores) and reductions in healthcare utilization would provide support for a mechanism of change in accordance with Friedman and colleagues' proposed untreated psychological problems pathway. These hypotheses will be tested using a subset of the treatment group, using patients for whom we have data on depression and anxiety scores over time. It is expected that a regression will reveal that decreases in PHQ-9 and GAD-7 scores over time will significantly predict decreases in treatment utilization over time.

Results

Matching

Initial matching retained 720 of 999 cases from the control group and 720 of 822 cases from the treated group. Model fit statistics indicated that there was sufficient balance among covariates, indicating an adequate specification ($\chi^2 = 13.8$, p = .09, |d| < .25). See Figure 1 for standardized mean differences of covariates before and after matching. Patient demographics and utilization breakdown for the matched sample are found in Tables 2-3.

Figure 1
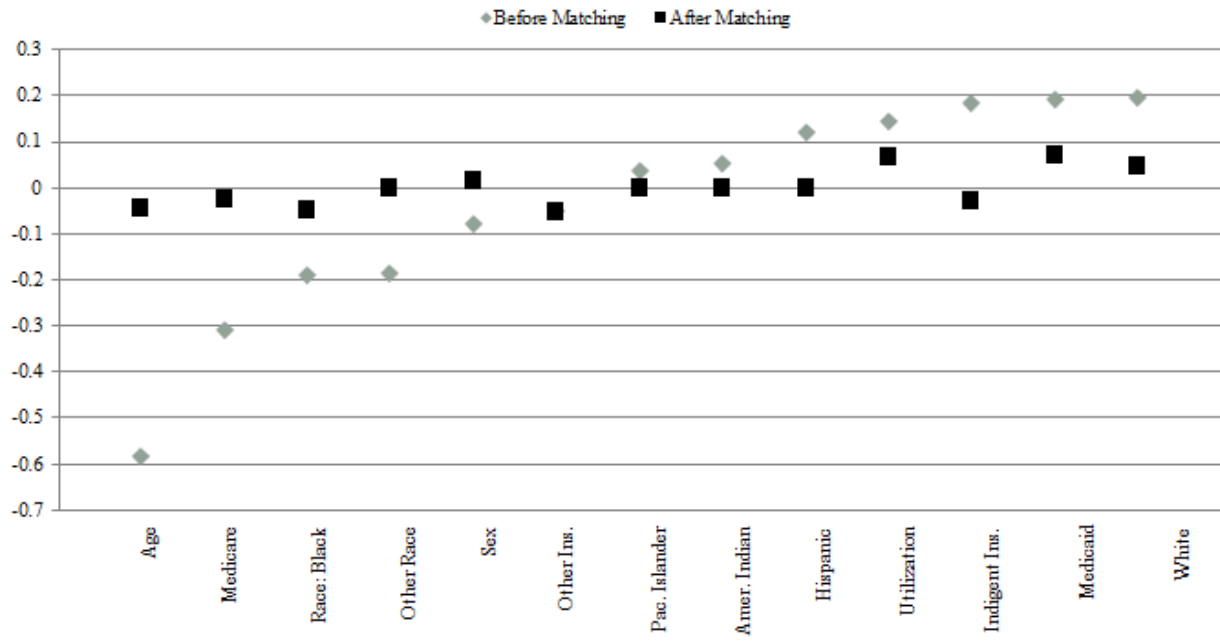*Standardized Mean Differences of Covariates Before and After Matching*

Table 2

Patient Demographics (Matched Sample)

	Sample 1 (seen by psychology) *N* = 720		Sample 2 (control group) *N* = 720		Total *N* = 1440	
	N (%)	Mean (SD)	N (%)	Mean (SD)	N (%)	Mean (SD)
Age		52.6 (13.4)		54.5 (13.1)		53.5 (13.3)
Sex						
Male	275 (38.2)		280 (38.9)		555 (38.5)	
Female	445 (61.8)		440 (61.1)		885 (61.5)	
Race						
Black	436 (60.6)		453 (62.9)		889 (61.7)	
White	281 (39.0)		264 (36.7)		545 (37.8)	
Asian	0 (0.0)		0 (0.0)		0 (0.0)	
Hispanic	0 (0.0)		0 (0.0)		0 (0.0)	
Pacific Islander	0 (0.0)		0 (0.0)		0 (0.0)	
Am. Indian	0 (0.0)		0 (0.0)		0 (0.0)	
Other	3 (0.4)		3 (0.4)		6 (0.4)	
Insurance						
Medicare	266 (36.9)		275 (38.2)		541 (37.6)	
Medicaid	132 (18.3)		112 (15.6)		244 (16.9)	
Indigent/VCC	265 (36.8)		266 (36.9)		531 (36.9)	
Other	57 (7.9)		67 (9.3)		124 (8.6)	

Table 3

Utilization Breakdown (Matched Sample)

	Sample 1 (seen by psychology) $N = 720$		Sample 2 (control group) $N = 720$		Total $N = 1440$	
	Median (IQR)	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	Mean (SD)
Baseline Total Utilization	10 (12)	12.1 (9.8)	8 (12)	11.4 (10.1)	9 (12)	11.8 (9.9)
Inpatient Visits	0 (1)	0.4 (0.9)	0 (1)	0.4 (1.0)	0 (1)	0.4 (1.0)
Primary Care Outpatient Visits	3 (4)	3.9 (3.2)	3 (4)	3.8 (3.2)	3 (4)	3.8 (3.2)
Specialty Outpatient Visits	4 (9)	6.9 (7.7)	4 (8)	6.4 (7.8)	4 (8)	6.7 (7.8)
Total Emergency Department Use	1 (2)	1.3 (2.4)	1 (2)	1.2 (2.0)	1 (2)	1.3 (2.2)
Emergency Department Use Not Followed by Inpatient Admit	0 (1)	1.0 (2.1)	0 (1)	0.8 (1.5)	0 (1)	0.9 (1.8)
Post-Treatment Total Utilization	10.5 (12)	12.6 (9.8)	10 (12)	12.2 (9.7)	10 (12)	12.4 (9.8)
Inpatient Visits	0 (0)	0.3 (0.9)	0 (0)	0.4 (1.0)	0 (0)	0.4 (0.9)
Primary Care Outpatient Visits	3 (4)	4.1 (3.5)	3 (4)	3.7 (3.2)	3 (5)	3.9 (3.3)
Specialty Outpatient Visits	5 (9)	7.6 (7.8)	5 (8)	7.5 (7.8)	5 (8)	7.6 (7.8)
Total Emergency Department Use	0 (1)	0.9 (1.8)	0 (1)	1.0 (2.0)	0 (1)	1.0 (1.8)
Emergency Department Use Not Followed by Inpatient Admit	0 (1)	0.6 (1.4)	0 (1)	0.6 (1.4)	0 (1)	0.6 (1.4)

Hypothesis Testing

Wilcoxon signed-rank tests were conducted in order to determine patterns of change in inpatient, emergency room, outpatient specialty, and outpatient primary care utilization – separately for PCC psychology patients and control group patients. Among patients seen by the PCPTP in this sample, inpatient utilization ($Z = -2.72$, $p = .01$, $r = .-07$), overall emergency department use ($Z = -5.65$, $p < .001$, $r = .-15$), and emergency department use not followed by an

inpatient admit ($Z = $ -5.14, $p < .001$, $r = .$-14) all demonstrated the predicted decreases from the year before to the year following PCC psychology visits. Also as predicted, outpatient primary care utilization remained stable during this time ($Z = $ -1.41, $p = .16$). Frequency of specialty outpatient visits demonstrated a significant increase ($Z = $ -2.63, $p = .01$, $r = .$-07).

Among PCC patients not seen by psychology trainees, a similar though not identical pattern emerged: frequencies of overall emergency department use ($Z = $ -3.04, $p = .002$, $r = .$-08) and emergency department use not followed by an inpatient admit ($Z = $ -3.44, $p = .03$, $r = .$-09) both decreased, specialty outpatient utilization increased ($Z = $ -4.03, $p < .001$, $r = .$-11), and there was no difference in outpatient primary care utilization ($Z = $ -0.74, $p = .46$). Change in inpatient utilization, however, was not significant ($Z = $ -0.51, $p = .61$). As this reduction in emergency department use was not hypothesized for this sample, further analyses were conducted in order to investigate whether the magnitude of change was different between patient samples. A Mann-Whitney *U*-test revealed a marginally significant difference between patients seen and not seen by the PCPTP with respect to overall emergency room use ($Z = 1.73$, $p = .08$) such that the PCPTP patients demonstrated a greater reduction in utilization, but no significant difference emerged with respect to emergency department use not followed by an inpatient admit ($Z = 1.49$, $p = .14$).

Defining frequent attenders as those patients whose total baseline utilization was at or above the 90th percentile resulted in an *n* of 96 in the sample of patients seen by the PCPTP. Comparing frequent attenders to non-frequent attenders using a Mann-Whitney *U*-test demonstrated that, as predicted, frequent attenders exhibited greater reductions in inpatient utilization, outpatient specialty visits, overall emergency department use, and emergency department use not followed by an inpatient admit (all *p*s < .01).

In order to determine whether these effects could be attributed to treatment rather than regression to the mean, a second propensity score analysis was conducted; this time matching frequent attenders from the treated group ($n = 96$) to those in the control group ($n = 105$). This matching procedure retained 78 of 96 cases from the treated group and 78 of 105 cases from the control group. Model fit statistics indicated that there was sufficient balance among covariates, indicating an adequate specification ($\chi^2 = 2.7$, p = .85, |d| < .25).

The above analyses were repeated for matched treated patients with similar results: significant reductions in inpatient utilization ($Z = -1.97$, $p < .05$, $r = -0.16$), specialty outpatient visits ($Z = -5.10$, $p < .001$, $r = -.41$), overall emergency department use ($Z = -4.11$, $p < .001$, $r = -.33$), and emergency department use not followed by an inpatient admit ($Z = -3.82$, $p < .001$, $r = -.31$). Among control group patients, significant decreases were seen with respect to outpatient specialty visits ($Z = -4.88$, $p < .001$, $r = -.39$), overall emergency department use ($Z = -2.95$, $p < .01$, $r = -.24$), and emergency department use not followed by an inpatient admit ($Z = -2.83$, $p < .01$, $r = -.23$). Unlike treated patients, there was no significant change in rates of inpatient utilization for control group patients ($Z = -1.10$, $p = .27$). The utilization breakdown for frequent attenders is presented in Table 4.

Table 4

Utilization Breakdown (Matched Frequent Attenders Sample)

	Sample 1 (seen by psychology) $N = 78$		Sample 2 (control group) $N = 78$		Total $N = 156$	
	Median (IQR)	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	Mean (SD)
Baseline Total Utilization	30 (14)	34.0 (10.2)	28 (10)	32.0 (11.4)	29 (12)	33.0 (10.9)
Inpatient Visits	1 (2)	1.1 (1.5)	1 (2)	1.3 (2.0)	1 (2)	1.2 (1.8)
Primary Care Outpatient Visits	6 (6)	7.2 (5.2)	7 (5)	7.6 (4.4)	7 (6)	7.4 (4.8)
Specialty Outpatient Visits	21 (11)	23.3 (10.4)	19 (9)	21.2 (10.7)	19.5 (10)	22.3 (10.6)
Total Emergency Department Use	2 (3)	3.5 (5.4)	2 (4)	3.1 (4.0)	2 (3)	3.3 (4.8)
Emergency Department Use Not Followed by Inpatient Admit	1 (3)	2.5 (4.5)	1 (2)	1.8 (2.7)	1 (3)	2.2 (3.7)
Post-Treatment Total Utilization	22 (17)	23.9 (12.2)	22 (16)	22.8 (12.5)	22 (16)	23.4 (12.4)
Inpatient Visits	0 (1)	0.8 (1.9)	0 (1)	1.0 (1.5)	0 (1)	0.9 (1.7)
Primary Care Outpatient Visits	5 (6)	5.9 (5.4)	6 (6)	5.5 (3.9)	5 (6)	5.7 (4.7)
Specialty Outpatient Visits	14 (11)	16.2 (10.6)	14 (14)	15.4 (11.1)	14 (13)	15.8 (10.8)
Total Emergency Department Use	1 (3)	1.6 (2.1)	0 (3)	2.0 (2.8)	1 (3)	1.8 (2.5)
Emergency Department Use Not Followed by Inpatient Admit	0 (1)	1.0 (1.6)	0 (1)	1.0 (1.9)	0 (1)	1.0 (1.7)

In order to assess the incremental effectiveness of behavioral medicine treatment in a primary care setting, Mann-Whitney *U*-tests were conducted comparing PCPTP patients who had been seen one or two times ($n = 553$) to those who had been seen three or more times ($n = 269$). Results reveal no significant differences with respect to reductions in overall emergency department use ($Z = 1.14$, $p = .25$), emergency department use not followed by an inpatient admit ($Z = 1.10$, $p = .27$), or inpatient utilization ($Z = 1.11$, $p = .27$).

Lastly, the role of improved mental health symptoms (i.e. reductions in depression and anxiety scores) was evaluated. GAD-7 and PHQ-9 scores were collected and recorded for a subset of patients seen by the PCPTP during this time ($n = 100$). Regressions revealed that after controlling for demographic variables, reduction in depression scores was not a significant predictor of reduction in emergency department use ($t = .65$, $p = .52$), emergency department use not followed by an inpatient admit ($t = .65$, $p = .52$), or inpatient utilization ($t = .66$, $p = .51$). Reduction in anxiety scores similarly did not demonstrate a significant association with overall emergency department use ($t = 1.30$, $p = .20$) or emergency department use not followed by an inpatient admit ($t = 1.30$, $p = .20$), though was a marginally significant predictor of inpatient use, overall model $F(8, 51) = 2.47$, $p = .02$, individual predictor $t = 1.85$, $p = .07$.

Discussion

The aim of this retrospective data analysis was to assess the impact of a primary care psychology training program (PCPTP) on rates of medical utilization among patients attending a community clinic. In accordance with the medical cost offset literature, this examination focused on high-cost services such as emergency department use and specialty outpatient visits. Based on previous research, other variables of interest included number of psychology visits (i.e. "dose"), the role of frequent attenders, and a potential mechanism for medical utilization reduction (improved mental health). Hypotheses predicted that while there would be no change in utilization rates among patients not seen in the PCPTP, those patients seen by psychology trainees would exhibit a reduction in high-cost services (emergency department, inpatient, specialty outpatient). Further, it was expected that patients seen in the PCPTP for three or more visits, those that demonstrated greater reductions in anxiety and depression symptoms, and those who could be classified as frequent attenders would experience the greatest reductions.

Overall, results of the current study provided mixed evidence to support the hypothesis that the PCPTP has an impact on medical utilization rates in this sample. While emergency department use decreased among these patients as predicted, this same pattern was also seen among patients not seen by the PCPTP. The magnitude of this reduction was comparable among patients in both groups with respect to emergency department use not followed by an inpatient admit, an indicator of unnecessary ED utilization. In terms of overall emergency department use, the reduction in utilization was marginally larger for patients seen by the PCPTP than those who were not. Contrary to predictions, rates of specialty outpatient use increased in both samples. Taken together, these results may be indicative of a wider hospital initiative to reduce high-cost ED visits which may have, in turn, increased rates of specialty outpatient use.

Rates of inpatient utilization, on the other hand, decreased significantly among PCPTP patients and exhibited no change among patients in the control group, indicating that there is likely an effect of behavioral and mental health treatment in this area. It is possible that having another treatment provider on a patient's medical team provides more opportunities for continued monitoring of care, especially because patients are often seen by the PCPTP in between their routine physician visits. Patients' concerns about changes in their health or medication refills are passed on to other providers, and these can sometimes be addressed without needing to schedule a separate appointment (and so would not be reflected in other utilization categories). In addition, PCPTP providers routinely provide psychoeducation and strategies regarding medication management, which may contribute to reductions in inpatient stays due to complications from chronic conditions such as diabetes or COPD.

Subsequent analyses investigated the role of important variables frequently seen in the cost-effectiveness literature: treatment "dosage," frequent attenders, and amelioration of mental

health symptoms as a potential mechanism. A majority of PCPTP patients are seen only once or twice, and previous literature has demonstrated that brief, rather than protracted, therapy produces the greatest benefits from a cost-offset perspective (Follette & Cummings, 1967). Thus, we used the division between one to two visits and three or more visits as a cut-off point for looking at the effect of treatment dosage. In this sample, there were no differences in terms of high-cost medical utilization reduction between PCPTP patients seen fewer than three times, and those seen three times or more. It is possible that the three-visit cut-off is too crude of a measure of treatment dosage; future analyses should perhaps analyze changes in utilization at one-visit increments in order to determine whether or when a difference emerges.

Looking at trends in utilization among frequent attenders, we found evidence for a strong reduction in high-cost services (emergency department visits, specialty outpatient visits, and inpatient services) subsequent to treatment by the PCPTP. Similar reductions in emergency department visits and specialty outpatient visits were seen among control group patients. With respect to inpatient visits, however, there was no significant difference in utilization for patients in the control group. These findings mirror those found in the overall sample, where there appears to be a treatment effect of PCPTP treatment on inpatient utilization such that behavioral and mental health treatment is associated with a subsequent decrease in these visits. Given the larger effect size of this finding among the frequent attenders sample, it is likely that inpatient utilization reduction among the overall sample of treated patients is driven by inpatient utilization reductions among treated frequent attenders in particular.

Lastly, reductions in anxiety and depression symptoms were largely unrelated with subsequent decreases in high-cost utilization, with one exception. Decrease in anxiety symptoms was a marginally significant predictor of reduction in inpatient visit frequency. It is possible that

this relationship would have reached statistical significance with a larger sample size, as we had

GAD-7 data for only a small portion of patients ($n = 59$). This relationship might shed additional

light on the above-described finding that PCPTP patients identified as frequent attenders, as well

as PCPTP patients as a whole, exhibited an overall reduction in inpatient stays that was not

found among patients in either matched control group: A 2013 Department of Health and Human

Services report reveals that chest pain accounted for the most common reason for inpatient

observation stays, a symptom that may have been reduced among PCPTP patients by anxiety

treatment.

Several factors limit the impact of these results. First, psychological symptom data were

limited for treated patients and absent for control group patients due to this being a retrospective

analysis. Assessment of depression and anxiety symptoms is not part of routine care in the PCC,

and while these measures are typically administered at PCPTP visits, these scores were

electronically recorded for only a small subset of patients. Second, there may be additional

matching variables that are important to consider that were unavailable for these analyses. These

might include number and severity of medical diagnoses, level of psychological distress, and

history of mental health treatment. By including baseline level of total healthcare utilization as a

covariate in our matching algorithm, we hope to have accounted for some of these factors

indirectly. Lastly, while many patients use VCUHS as a facility for most, if not all, of their

medical needs, this is not true of all patients – if they received treatment elsewhere, those visits

are not accounted for in these results.

Despite these limitations, this study has a number of strengths that represent a significant

contribution to a nascent literature. First, this is a novel analysis in that it is the first to investigate

the cost-offset effect in an integrated care, safety-net training clinic operating as usual. This is an

important point in that it may amplify cost savings if interventions are effective in reducing unnecessary healthcare utilization even when implemented by trainees. While the retrospective nature of the data introduces some limitations, it also addresses weaknesses found in many previous studies by including objective measures of utilization and providing a large sample size. Furthermore, we were able to explore the impact of behavioral health intervention across a variety of outcome variables, as VCUHS provides a wide range of services spanning both inpatient and outpatient settings and serves as a medical care home for many of its patients. Lastly, the construction of a control group through the use of propensity score matching provided the opportunity to make direct comparisons and bolster the finding that behavioral health intervention has an impact in reducing inpatient visits.

The results of this retrospective analysis warrant the design of a prospective study that can account for some of the identified limitations while expanding upon the findings reported here. The association between behavioral health intervention, reduction in anxiety symptoms, and reduction in inpatient stays in particular should be explored further. Despite the statistically significant decrease in frequency of inpatient stays among treated patients compared to control group patients, the modal number of inpatient visits across samples was 0, and so it is difficult to assess the real-world significance of this change due to a likely floor effect. Subsequent investigations should include analysis of additional variables such as length of inpatient stay, reason for inpatient admit, and behavioral health intervention target (e.g. anxiety, medication adherence) that might shed additional light on this finding. Furthermore, deliberate construction of a control group would allow for assessment of depression and anxiety in both groups that would serve to clarify the role of mental health improvement as a pathway to reduced medical

utilization. Lastly, future studies should include an assessment of cost savings or clinical significance, as these measures were outside the scope of the current study.

Finally, while the current study focused on reduction in mental health symptoms as a mechanism by which behavioral/mental health intervention leads to reductions in utilization, several other pathways identified by Friedman and colleagues (1995) are easily measured in this setting. For example, the PCPTP might consider giving a standardized measure of health behaviors (e.g. alcohol/tobacco use, sleep quality, caloric intake, physical activity, medication adherence) throughout treatment in order to assess the behavior change pathway to reduced medical utilization. It is also conceivable that PCPTP visits might affect the social support pathway in that student clinicians provide emotional support, help patients communicate more effectively with their physicians, and encourage patients to engage socially outside of the healthcare setting. Thus, including a measure of social support may also contribute to more robust findings in future analyses.

List of References

American Medical Association (2012). *Getting the most for our health care dollars: Strategies to address rising health care costs*. Retrieved from http://www.ama-assn.org/resources/doc/health-care-costs/strategies-rising-costs.pdf

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author.

Andersen, R. & Newman, J.F. (1973). Societal and individual determinants of medical care utilization in the United States. *Milbank Memorial Fund Quarterly: Health and Society, 51*(1), 95-124.

Barsky, A.J., Orav, E.J., & Bates, D.W. (2005). Somatization increases medical utilization and costs independent of psychiatric and medical comorbidity. *Archives of General Psychiatry, 62*(8), 903-910.

Berkanovic, E., Telesky, C. & Reeder, S. (1981). Structural and social psychological factors in the decision to seek medical care for symptoms. *Medical Care, 19,* 693-709.

Bernstein, A.B., Hing, E., Moss, A.J., Allen, K.F., Siller, A.B., & Tiggle, R.B. (2003). Health care in America: Trends in utilization. *National Center for Health Statistics.* Retrieved from http://stacks.cdc.gov/view/cdc/11299/

Borgquist, L., Hansson, L., Nettelbladt, P., Nordstrom, G., & Lindelow, G. (1993). Perceived health and high consumers of care: A study of mental health problems in a Swedish primary health care district. *Psychological Medicine, 23*(3), 763-770.

Broadhead, W.E., Gehlbach, S.H., DeGruy, F.V., & Kaplan, B. (1989). Functional versus structural social support and health care utilization in a family medicine outpatient practice. *Medical Care, 27*(3), 221-233.

Budman, S.H., Demby, A., & Feldstein, M.L. (1984). Insight into reduced use of medical services after psychotherapy. *Professional Psychology: Research and Practice, 15*(3), 353-361.

Centers for Disease Control (2010). Deaths: Leading causes for 2009. *National Vital Statistics Reports, 61*(7), 1-96.

Centers for Medicare and Medicaid Services (2012). *National healthcare expenditures data*. Retrieved from https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics Trends-and-Reports/NationalHealthExpendData/downloads/tables.pdf

Chiles, J.A., Lambert, M.J., & Hatch, A.L. (1999). The impact of psychological interventions on medical cost offset: A meta-analytic review. *Clinical Psychology: Science and Practice, 6*(2), 204-220.

Cleary, P.D., Mechanic, D., & Greenley, J.R. (1982). Sex differences in medical care utilization: An empirical investigation. *Journal of Health and Social Behavior, 23*(2), 106-119.

Cohen, B.E., Gima, K., Bertenthal, D., Kim, S., Marmar, C.R., & Seal, K.H. (2010). Mental health diagnoses and utilization of VA non-mental health medical services among returning Iraq and Afghanistan veterans. *Journal of General Internal Medicine, 25*(1), 18-24.

Cohen, S., Janicki-Deverts, D., & Miller, G.E. (2007). Psychological stress and disease. *Journal of the American Medical Association, 298,* 1685-1687.

Cohen, S., Tyrrell, D.A., & Smith, A.P. (1991). Psychological stress and susceptibility to the common cold. *New England Journal of Medicine, 235*(9), 606-612.

Cohen, S. & Wills, T.A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98*, 310-357.

Collins, C. (2009). Integrating behavioral and mental health services into the primary care setting. *North Carolina Medical Journal, 70*(3), 248-252.

Conwell, Y., Olsen, K., Caine, E., & Flannery, C. (1991). Suicide in later life: psychological autopsy findings. *International Psychogeriatrics, 3*(1), 59-66.

Cummings, N. A., Kahn, B. I., & Sparkman, B. (1962). *Psychotherapy and medical utilization: A pilot study*. Oakland, CA: Annual Reports of Kaiser Permanente Research Reports.

Cummings, N.A., O'Donohue, W.T., & Cummings, J.L. (2009). The financial dimension of integrated behavioral/primary care. *The Journal of Clinical Psychology in Medical Settings, 16*(1), 31-39.

Cummings, N.A., O'Donohue, W.T., & Ferguson, K.E. (Eds.). (2003). *Behavioral health in primary care: Beyond efficacy to effectiveness*. Cummings Foundation for Behavioral Health: Health utilization and cost series (Vol. 6). Reno, NV: Context Press.

D'Agnostino, R.B. (1998). Propensity score methods for bias reduction in the comparison of a treatment to a non-randomized control group. *Statistics in Medicine, 17*(19), 2265-2281.

Department of Health and Human Services (2014). *Hospitals' use of observation stays and short inpatient stays for Medicare beneficiaries.* Retrieved from http://oig.hhs.gov/oei/reports/oei-02-12-00040.pdf

Diabetes Prevention Program Research Group (2002). Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine, 346*, 393-403.

Donaldson, C. & Gerard, K. (1989). Countering moral hazard in public and private health care systems: A review of recent evidence. *Journal of Social Policy, 18*(2), 235-251.

Donovan, D.M., & Marlatt, G.A. (1993). Recent developments in alcoholism behavioral treatment. *Recent Developments in Alcoholism, 11,* 397-411.

Dorn, T., Yzermans, C.J., Kerssens, J.J., Spreeuwenberg, P.M., & van der Zee, J. (2006). Disaster and subsequent healthcare utilization: A longitudinal study among victims, their family members, and control subjects. *Medical Care, 44*(6), 581-589.

Egede, L.E. (2007). Major depression in individuals with chronic medical disorders: prevalence, correlates and association with health resource utilization, lost productivity and functional disability. *General Hospital Psychiatry, 29*(5), 409-416.

Estruch, R., Ros, E., Salas-Salvado, J., Covas, M., Corella, D., Aros, F., … Martinez-Gonzalez, M.A. (2013). Primary prevention of cardiovascular disease with a Mediterranean diet. *New England Journal of Medicine, 368*, 1279-1290.

Finkelstein, E.A., Trogdon, J.G., Cohen, J.W., & Dietz, W. (2009). Annual medical spending attributable to obesity: Payer- and service-specific estimates. *Health Affiars, 28*(5), Epub.

Follette, W. T., & Cummings, N. A. (1967). Psychiatric services and medical utilization in a prepaid health plan setting. *Medical Care, 5*, 25–35.

French, M.T., McGeary, K.A., Chitwood, D.D., & McCoy, C.B. (2000). Chronic illicit drug use, health services utilization, and the cost of medical care. *Social Science & Medicine, 50*(12), 1703-1713.

Friedman, R., Sobel, D., Myers, P., Caudill, M., & Benson, H. (1995). Behavioral medicine, clinical health psychology, and cost offset. *Health Psychology, 14*(6), 509-518.

Garg, N., Wansink, B., & Inman, J.J. (2007). The influence of incidental affect on consumers' food intake. *Journal of Marketing, 71*(1), 194-206.

Gatchel, R.J. & Oordt, M.S. (2003). Clinical health psychology in the primary care setting: an overview. *Clinical health psychology and primary care: Practical advice and clinical guidance for successful collaboration* (3-19). Washington, DC: American Psychological Association.

Gill, D., & Sharpe, M. (1999). Frequent consulters in general practice: A systematic review of studies of prevalence, associations, and outcome. *Journal of Psychosomatic Research, 47*(2), 115-130.

Glass, D.C., Singer, J.E., & Friedman, L.N. (1969). Psychic cost of adaptation to an environmental stressor. *Journal of Personality and Social Psychology, 12*(3), 200-210.

Goldberg, D. (2010). The detection and treatment of depression in the physical ill. *World Psychiatry, 9,* 19-20.

Gouge, N. (2013). *Uncovering indirect benefits of utilizing an on-site behavioral health provider* [pdf document]. Retrieved from https://www.dropbox.com/sh/7umrgl3wmm9ezly/ iugIJTXb4C/Gouge%20Dissertation%2015%20minutes.pdf

Guldin, M.B., Jensen, A.B., Zachariae, R., & Vedsted, P. (2013). Healthcare utilization of bereaved relatives of patients who died from cancer: A national population-based study. *Psychooncology, 22*(5), Epub.

Hansen, G.R. (2005). The drug-seeking patient in the emergency room. *Emergency Medical Clinics of North America, 23,* 349-365.

Hellman, C.J.C., Budd, M., Borysenko, J., McClelland, D.C., & Benson, H. (1990). A study of the effectiveness of two group behavioral medicine interventions for patients with psychosomatic complaints. *Behavioral Medicine, 16*, 165-173.

Hodgson, P., Smith, P., Brown, T., & Dowrick, C. (2005). Stories from frequent attenders: A qualitative study in primary care. *Annals of Family Medicine, 3*(4), 318-323.

Institute of Medicine (2012). *Best care at lower cost: The path to continuously learning health care in America*. Retrieved from http://iom.edu/Reports/2012/Best-Care-at-Lower-Cost-The-Path-to-Continuously-Learning-Health-Care-in-America.aspx

Jiwa, M. (2000). Frequent attenders in general practice: An attempt to reduce attendance. *Family Practice, 17*(3), 248-251.

Kaplan, B.H., Cassel, J.C., & Gore, S. (1977). Social support and health. *Medical Care, 15*(5 Suppl), 47-58.

Katerndahl, D.A., & Realini, J.P. (1995). Where do panic attack sufferers seek care? *The Journal of Family Practice, 40*(3), 237-243.

Katon, W. (1984). Depression: Relationship to somatization and chronic medical illness. *Journal of Clinical Psychiatry, 45*(3), 4-12.

Katon, W. (1996). Panic disorder: Relationship to high medical utilization, unexplained physical symptoms, and medical costs. *The Journal of Clinical Psychiatry, 57*(Suppl 10), 11-18.

Katon, W., Berg, A.O., Robins, A.J., Risse, S. (1986). Depression – medical utilization and somatization. *The Western Journal of Medicine, 144*(5), 564-568.

Katz, I. (1996). On the inseparability of mental and physical health in aged persons: Lessons from depression and medical comorbidity. *American Journal of Geriatric Psychiatry, 4*, 1-16.

Kenford, S.L., Smith, S.S., Wetter, D.W., Jorenby, D.E., Fiore, M.C., & Baker, T.B. (2002). Predicting relapse back to smoking: Contrasting affective and physical models of dependence. *Journal of Consulting and Clinical Psychology, 70*(1), 216-227.

Kirmayer, L.J. & Robbins, J.M. (1991). Three forms of somatization in primary care: Prevalence, co-occurrence, and sociodemographic characteristics. *The Journal of Nervous and Mental Disease, 179*(11), 647-655.

Kroenke, K., Spitzer, R.L., & Williams, J.B. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*(9), 606-613.

Lipowski, Z.J. (1998). Somatization: The concept and its clinical application. *The American Journal of Psychiatry, 145*(11), 1358-1368.

Lorig, K.R., Mazonson, P.D., & Holman, H.R. (1993). Evidence suggesting that health education for self-management in patients with chronic arthritis has sustained health benefits while reducing health care costs. *Arthritis and Rheumatism, 36*(4), 439-446.

Lynch, W.D. & Vickery, D.M. (1993). The potential impact of health promotion on health care utilization: An introduction to demand management. *American Journal of Health Promotion, 8*(3), 87-92.

Lyness, J.M., Conwell, Y., & Nelson, J. C. (1992). Suicide attempts in elderly psychiatric inpatients. *Journal of the American Geriatrics Society, 40*(4), 320-324.

Macdonald, S., Wells, S., Giesbrecht, N., & Cherpitel, C.J. (1999). Demographic and substance use factors related to violent and accidental injuries: Results from an emergency room study. *Drug and Alcohol Dependence, 55*(1-2), 53-61.

Mack, L. and Rybarczyk, B.D. (2011). Behavioral treatment of insomnia: A proposal for a stepped-care approach to promote public health. *Nature and Science of Sleep, 3,* 87-99.

Manning, W. & Wells, K. (1992). The effects of psychosocial distress and psychological well-being on use of medical services. *Medical Care, 30,* 541-553.

Marciniak, M., Lage, M.J., Landbloom, R.P., Dunayevich, E. & Bowman, L. (2004). Medical and productivity costs of anxiety disorders: Case control study. *Depression and Anxiety, 19*(2), 112-120.

Mechanic, D. (1981). Impact of psychological treatment on health status. In K.Jones (Ed.), *Report of a conference on the impact of alcohol, drug abuse, and mental health treatment on medical care utilization* (DHHS Publication No. ADM 81-1180), Washington, DC: U.S. Government Printing Office.

Mumford, E., Schlesinger, H.J., Glass, G.V., Patrick, C., & Cuerdon, T. (1984). A new look at evidence about reduced cost of medical utilization following mental health treatment. *The Journal of Psychotherapy Practice and Research, 7*(1), 68-86.

Murray, J., & Corney, R., (1989). Locus of control in health: The effects of psychological well-being and contact with the doctor. *The International Journal of Social Psychiatry, 35*(4), 361-369.

National Center on Addiction and Substance Abuse (2009). *The cost of substance abuse to America's health care*. Retrieved from http://www.casacolumbia.org/upload/2011/199307costofsubstanceabuse.pdf

National Institute on Drug Abuse (n.d.). *Medical consequences of drug abuse.* Retrieved from http://www.drugabuse.gov/related-topics/medical-consequences-drug-abuse

O'Donohue, W.T., Ferguson, K.E., & Cummings, N.A. (2001). Introduction: Reflections on the medical cost offset effect. *The Impact of Medical Cost Offset on Practice and Research: Making it work for you: A report of the First Reno Conference on Medical Cost Offset* (11-25). Reno, NV: Context Press.

Organisation for Economic Co-operation and Development (2012). *OECD health data* [Data file]*.* Retrieved from http://stats.oecd.org/Index.aspx?DatasetCode=HEALTH_STAT

Pallak, M.S., Cummings, N.A., Dorken, H., & Henke, C.J. (1995). Effect of mental health treatment on medical costs. *Mind/Body Medicine, 1*, 7-12.

Pear, R. (2011). Health official takes parting shot at 'waste.' *The New York Times.* Retrieved from http://www.nytimes.com/2011/12/04/health/policy/parting-shot-at-waste-by-key-obama-health-official.html?_r=0

Robinson, J.O., & Granfield, A.J. (1986). The frequent consulter in primary medical care. *Journal of Psychosomatic Research, 30*(5), 589-600.

Robinson, J.S., Schwartz, M.L., Magwene, K.S., Krengel, S.A., & Tamburello, D. (1989). The impact of fever health education on clinic utilization. *American Journal of Disease of Children, 143*(6), 698-704.

Rocovich, C. & Patel, T. (2012). Emergency department visits: Why do adults choose the emergency room over a primary care physician visit during regular office hours? *World Journal of Emergency Medicine, 3*(2), 91-97.

Rosenbaum, P.R., & Rubin, D.B. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician, 39*(1), 33-38.

Rush, B. (1989). The use of family medical practices by patients with drinking problems. *Canadian Medical Association Journal, 140,* 35-39.

Sadock, E., Auerbach S.M., Rybarczyk, B., & Aggarwal, A. (2014). Evaluation of integrated psychological services in a university-based primary care clinic. *Journal of Clinical Psychology in Medical Settings, 1,* 19-32.

Sensky, T., MacLeod, A.K., & Rigby, M.F. (1996). Causal attributions about common somatic sensations among frequent general practice attenders. *Psychological Medicine, 26*(3), 641-646.

Shellenberger, R.D., Turner, J., Green, J., & Cooney, J.B. (1986). Health changes in a biofeedback and stress management program. *Clinical Biofeedback & Health: An International Journal, 9*(1), 23-34.

Simpson, R.J., Kazmierczak, T., Power, K.G., & Sharp, D.M. (1994). Controlled comparison of the characteristics of patients with panic disorder. *The British Journal of General Practice, 44*(385), 352-356.

Sobel, D.S. (2000). The cost-effectiveness of mind-body medicine interventions. *Progress in Brain Research, 122,* 393-412.

Spitzer, R.L., Kroenke, K., Williams, J.B., & Lowe, B. A brief measure for assessing generalized anxiety. *Archives of Internal Medicine, 166,* 1092-1097.

Strain, J.J., Lyons, J.S., Hammer, J.S., Fahs, M., Lebovits, A., Paddison, P.L., Snyder, S., ..., & Nuber, G. (1991). Cost offset from a psychiatric consultation-liaison intervention with elderly hip fracture patients. *American Journal of Psychiatry, 148*, 1044-1049.

Tessler, R., Mechanic, D., & Dimond, M. (1976). The effect of psychological distress on physician utilization: A prospective study. *Journal of Health and Social Behavior, 17*(4), 353-364.

Thoemmes, F. (2012). Propensity score matching in SPSS. Retrieved from http://arxiv.org/abs/1201.6385

Wertlieb, D., Budman, S. H., Demby, A., & Randall, M. (1982). The stress of marital separation: Intervention in a health maintenance organization. *Psychosomatic Medicine, 44*, 437-448.

Widmer, R.B. & Cadoret, R.J. (1978). Depression in primary care: changes in pattern of patient visits and complaints during a developing depression. *The Journal of Family Practice, 7*(2), 293-302.

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