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# Toward Understanding the Healthcare Value of Veterans Affairs' Primary Care – Mental Health Integration

A dissertation submitted in partial satisfaction of the requirements for the degree

Doctor of Philosophy in Health Policy and Management

by

Lucinda Leung

2017

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ABSTRACT OF THE DISSERTATION

Toward Understanding the Healthcare Value of Veterans Affairs' Primary Care – Mental Health Integration

by

Lucinda Leung

Doctor of Philosophy in Health Policy and Management

University of California, Los Angeles, 2017

Professor José J. Escarce, Chair

Access to high-quality mental health specialty care for primary care patients has historically been problematic. Behavioral health care integration into the patient-centered medical homes has been shown to be effective, but dissemination and implementation of these team-based models of care remain challenging to healthcare systems. As such, lessons can be learned from VA's national implementation of Primary Care–Mental Health Integration (PC-MHI). Here we devise and validate a new metric for VA clinic engagement in PC-MHI (number of PC-MHI service users/number of primary care patients) during each year.

This is a retrospective longitudinal cohort study of 112,737 primary care patients in 29 Southern California VA clinics from October 1, 2008 to September 30, 2013. First, we examined a subset of 66,638 patients with mental health diagnoses to understand access to mental health care and other healthcare services. Our multilevel regression models used clinic

PC-MHI engagement to predict relative rates for the full-range of patient healthcare utilization and total VA costs, adjusting for year and clinic fixed effects, other clinic interventions, and patient characteristics. Then, we constructed quality metrics for 12,663 patients who were newly diagnosed to have depression. Our fully-adjusted regression models used clinic PC-MHI engagement to predict probabilities of follow-up within 84 and 180 days and receipt of minimally appropriate treatment for these patients.

Greater clinic PC-MHI engagement was associated with significantly more mental health visits and less non-primary care based mental health specialty (MHS) visits, consistent with a substitution of PC-MHI visits for MHS visits. It was associated with less general MHS visits, rather than more specialized MHS visits. This reduction appeared targeted at patients with mild-to-moderate mental illnesses (i.e., depression), rather than with serious mental illness (i.e., schizophrenia, bipolar disorder). Despite shifting mental health care for Veterans with less complicated mental illnesses from specialty to primary care, our findings demonstrated no difference in depression care quality. We did not find adverse impacts on ED visits, hospitalizations, total patient costs, or mortality. Therefore, PC-MHI may improve mental healthcare value for primary care patients, as it may have improved realized accessibility to mental health care without necessarily increasing costs.

The dissertation of Lucinda B. Leung is approved.

Lisa V. Rubenstein

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Kenneth B. Wells

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University of California, Los Angeles

2017

# DEDICATION

In dedication...

To my two beautiful children, both of whom blessed me with their arrivals during the course of this work

To my dear life partner, whose steadfast love and commitment to our children and me remain unrivaled

To my remaining family and friends, whom continue to express their support in between asking “Another degree?” and “Is that Grade 28 or 29?”

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LIST OF ACRONYMS

| Acronym | Definition |
|---|---|
| AHRQ | Agency for Healthcare Research & Quality |
| BHL | Behavioral Health Laboratory |
| DIAMOND | Depression Improvement Across Minnesota, Offering a New Direction |
| DSM | Diagnostic and Statistical Manual of Mental Disorders |
| EBQI | Evidence Based Quality Improvement |
| ED | Emergency Department |
| FY | Fiscal Year |
| IMPACT | Improving Mood - Promoting Access to Collaborative Treatment |
| MHS | Mental Health Specialty |
| NCQA | National Committee for Quality Assurance |
| NIMH | National Institute of Mental Health |
| PACT | Patient Aligned Care Team |
| PC-MHI | Primary Care - Mental Health Integration |
| PCP | Primary Care Provider |
| PTSD | Post-traumatic Stress Disorder |
| RCT | Randomized Controlled Trial |
| SAIL | Strategic Analytics for Improvement and Learning |
| SAMHSA | Substance Abuse and Mental Health Services Administration |
| TIDES | Translating Initiatives for Depression into Effective Solutions |
| VA | Veterans Affairs |
| VHA | Veterans Health Administration |

ACKNOWLEGEMENTS

This work would not have been possible without the mentorship of my dissertation committee: José, who taught me the meaning of academic rigor and inspires me as a Renaissance individual; Lisa, who awes me with her donning of both clinical and research hats to improve Veteran care; Ken, who guided a PCP tackling a specialty issue and pushes me to extend my work beyond the VA; Catherine, who imbued me with a statistical core necessary for a health services research career. *Thank you for believing in me, showing me that this career is possible with family, and emphasizing that the dissertation is only be the beginning of a successful academic career.*

I am ever grateful for funding and support from the Veterans Assessment & Improvement Laboratory, Robert Wood Johnson Foundation VA Clinical Scholars Program, UCLA Specialty Training and Advanced Research Program, and VA Quality Scholars Program.

A modified version of chapter two is in-press with *Journal of the American Board of Family Medicine* (Leung LB, Yoon J, Rubenstein LV, Post EP, Metzger M, Wells KB, Sugar CA, Escarce JJ; Changing Patterns of Mental Healthcare Use: The Role of Integrated Mental Health Services in VA Primary Care). A modified version of chapter three is in-press with *Psychiatric Services* (Leung LB, Yoon J, Escarce JJ, Post EP, Wells KB, Sugar CA, Yano EM, Rubenstein LV; Primary Care-Mental Health Integration: Shifting Mental Health Services for Common Mental Illnesses to VA Primary Care).

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### A. Personal Statement

I am a practicing general internal medicine physician with specialized experience in serving veterans and safety net populations. I am also a PhD candidate in Health Policy and Management at UCLA Fielding School of Public Health. In my post-doctoral training, I have been funded by the Robert Wood Johnson Foundation, Department of Veterans Affairs, and UCLA to conduct health services research related to primary care delivery. Currently, I serve as a lead investigator on several research projects studying integrated mental health services in primary care settings. My research has employed a wide range of methodologies: community-partnered research approaches, behavioral health interventions, mixed-methods research, longitudinal cohort analysis, and other secondary data analysis. These studies have culminated in presentations and publications disseminated to the scientific and broader community. I bring both my clinical perspective and research experience in evaluating and implementing best practices in primary care delivery. These contributions will strengthen the scale-up and spread of evidence-based primary care innovations in which the UCLA and VA research community has great expertise.

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## C. Selected Peer-reviewed Publications

1. **Leung LB**, Busch AM, Nottage SL, Arellano N, Glieberman E, Busch NJ, Smith SR. Approach to Antihypertensive Adherence: a feasibility study on the use of student health coaches for uninsured hypertensive adults. *Behav Med.* 2012 Jan;38(1):19-27.
2. Binagwaho A, Mugwaneza P, Irakoze AA, Nsanzimana S, Agbonyitor M, Nutt CT, Wagner CM, Rukundo A, Ahayo A, Drobac P, Karema C, Hinda R, **Leung L**, Bandara S, Chopyak E, Fawzi MC. Scaling up early infant diagnosis of HIV in Rwanda, 2008-2010. *J Public Health Policy*. 2013 Jan;34(1):2-16.
3. Khalili J, **Leung LB**, Diamant A. Finding the Perfect Doctor: Identifying LGBT-Competent Healthcare Providers. *Am J Public Health*. 2015 Jun;105(6):1114-9.
4. **Leung LB**, Simmons JE, Ho J, Anselin E, Yalamanchili R, Rabatin JS. A Five-Year Evolution of a Student-led Elective and its Role in Shaping Health Disparities Medical Curricula. *RI Med J.* 2016 Oct 4;99(10):43-47.
5. **Leung LB**, Vargas-Bustamante A, Martinez AE, Chen X, Rodriguez HP. Disparities in Diabetes Care Quality by English Language Preference in Community Health Centers. *Health Serv Res.* 2016 Oct 21. doi:10.1111/1475-6773.
6. **Leung LB**, Escarce JJ. Consumer-directed Health Plans: Do Doctors and Nurses Buy In? *Am J Manag Care. 2017;23(3):e89-e94.*
7. **Leung LB**, Yoon J, Rubenstein LV, Post EP, Metzger M, Wells KB, Sugar CA, Escarce JJ. Changing Patterns of Mental Healthcare Use: The Role of Integrated Mental Health Services in VA Primary Care. *Journal of the American Board of Family Medicine.* (In press.)
8. **Leung LB**, Yoon J, Escarce JJ, Post EP, Wells KB, Sugar CA, Yano EM, Rubenstein LV. Primary Care-Mental Health Integration: Shifting Mental Health Services for Common Mental Illnesses to VA Primary Care. *Psychiatric Services.* (In press.)

## Chapter 1. Introduction

"We envision a future when everyone with a mental illness will recover, a future when mental illnesses can be prevented or cured, a future when mental illnesses are detected early, and a future when everyone with a mental illness at any stage of life has access to effective treatment and supports — essentials for living, working, learning, and participating fully in the community."

— President's New Freedom Commission on Mental Health, 2003[1]

### Poor Mental Healthcare Access and Quality in Primary Care

Mental illness is prevalent among primary care patients and may lead to serious complications. Approximately a quarter of the primary care population are diagnosed with at least one mental health disorder[2]; yet, many more patients, specifically half of those with depression, remain undiagnosed.[3] The quality of mental healthcare is also far from optimal, as one study reported that half of survey respondents with a mental disorder received any mental healthcare in the past year and only 14% received care that was evidence-based.[4] Patient outcomes are similarly disconcerting—disability from mental and behavioral health disorders accounted for 7.4% of healthy years lost worldwide in 2010.[5] In addition, patients with comorbid depression are dying approximately 10 to 20 years earlier from chronic medical illness.[6]

Veterans, who commonly experience unspeakable events during their tour of duty, tend to experience mental illness to a greater degree than civilians. Approximately 30-percent of U.S. Department of Veteran Affairs (VA) patients have diagnosed a mental health disorder.[7] This number continues to rise with greater provider recognition and universal mental health screening in the VA. In addition to a high burden of mental health disease, Veterans cared for within VA

healthcare systems report poorer health statuses and more medical conditions than similar Veterans who receive care outside of VA hospitals and clinics.[8] Veterans with mental health diagnoses have been found to use more inpatient and outpatient healthcare, mostly for their non–mental health primary diagnoses, and to be 2.7 times more expensive than those without such diagnoses.[9]

As a result, the Veterans Health Administration (VHA), the VA's healthcare delivery branch, is one of the nation's largest integrated public-sector mental healthcare systems[10] and has undertaken several mental health–specific initiatives to increase the proportion of veterans receiving evidence-based treatments.[11] Even when given a choice, Veterans have been found to receive mental healthcare in the VA, with a study reporting that only 3-4% of Medicare-eligible VA primary care patients seek mental healthcare elsewhere.[12] Furthermore, the quality of VA mental healthcare for Veterans is similar to or better than the care provided to privately insured patients or to those enrolled in Medicare or Medicaid,[9] with VA performance superior to that of the private sector by more than 30% in medication treatment.[13] Yet, there is room for improvement given the variation in performance across regions and the low rate of delivery for some evidence-based practices.[9]

For many reasons, primary care, as provided by the VA and elsewhere, has become the de facto location of care for patients with common mental disorders. The 1978 Epidemiology Catchment Area Study first documented that over half of United States community respondents with depressive and anxiety disorders were treated exclusively in primary care settings.[14] Existing mental healthcare programs may have less capacity to treat all patients in need as quickly as primary care. For example, for the Greater Los Angeles VA Healthcare System, timely (< 30 days) completion of new mental health appointments is below 10th percentile of

VA facilities across the nation, whereas timely completion of new primary care appointments is near the 50th percentile, according to VHA's Strategic Analytics for Improvement and Learning (SAIL) performance metrics.[15] Furthermore, only half of primary care patients follow through with mental health referrals[16] and those who follow through, on average, have only two specialty mental health visits.[17] For VA primary care patients newly detected with depression, rates of receiving three or more follow-up mental health visits at 84 and 180 days, per VA and National Committee for Quality Assurance (NCQA) depression performance criteria, have increased but remain low, respectively 56% and 63% in 2010.[18] While shouldering the burden of mental healthcare, primary care providers may not feel supported by mental health specialists[19] and may not achieve standards of depression care (i.e., adequate dosing and duration of pharmacotherapy or psychotherapy) set by evidence-based guidelines.[20,21]

**Strong Evidence Base for Behavioral Health Integration in Primary Care**

The growing need for improved mental healthcare access and quality in primary care contributed to the development of integrated care. Experts define this as "care that results from a practice team of primary care and behavioral health clinicians, working together with patients and families, using a systematic and cost-effective approach to provide patient-centered care for a defined population."[22] In other words, integrated care occurs when mental health specialty and primary care providers work together to address both the physical and mental health needs of their patients, including mental health and substance abuse conditions, health behaviors, life stressors and crises, stress-related physical symptoms, and ineffective use of healthcare resources. Integration can work in either of two directions, (1) specialty mental health care introduced into primary care settings, or (2) primary health care introduced into specialty mental

health settings.[23] This doctoral dissertation will only address the former type.

The evidence base supporting integrated care for common mental illnesses treated in primary care (i.e., depression, anxiety) is extensive. Although earlier attempts at co-locating mental health specialists within primary care clinics may not be as effective,[24] newer collaborative care models appear to significantly improve quality of care and depressive and anxiety outcomes compared to usual primary care in a meta-analysis of 79 randomized controlled trials (RCTs).[25] The Improving Mood—Promoting Access to Collaborative Treatment (IMPACT trial) is the largest study to date in support of collaborative care models,[26] which are recommended as best practice by the U.S. Surgeon General,[27] Substance Abuse and Mental Health Services Administration (SAMHSA),[28] President's New Freedom Commission on Mental Health,[1] and Agency for Healthcare Research and Quality (AHRQ).[23] In addition to robust patient outcomes findings, collaborative care has been found to be more cost-effective than usual care[29,30] and, in some cases, to be associated with cost savings.[31]

Collaborative care is an effective integrated care model and rooted in five core principles: patient-centered care, evidence-based care, measurement-based treatment to target, population-based care, and accountable care.[32] In these models, a care manager and psychiatric consultant work together to support patients and their primary care providers (PCPs). Services provided include 1) informal "curbside consultations" with the psychiatric consultant and PCP in person or by telephone, 2) systematic case review meetings where all patients with diagnostic or therapeutic challenges are reviewed by all providers, 3) occasional face-to-face consultations with the psychiatric consultant and patient in person or by televideo connection, and 4) treatment recommendations conveyed directly to the PCP by the psychiatric consultant or care manager.

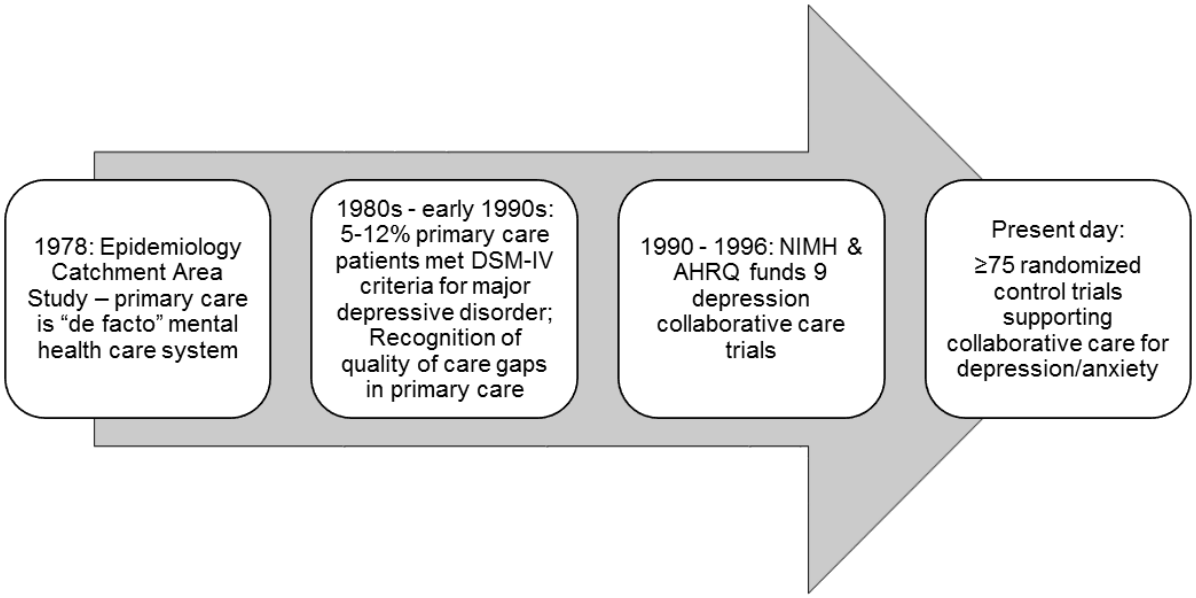
The evidence in support of collaborative care extends beyond depressed or anxious

adults, but to patients with other common mental health conditions (e.g., post-traumatic stress disorder [PTSD]) and co-morbid medical conditions (e.g., heart disease, diabetes). Because this model was largely inspired by the Chronic Care Model,[33] which is a proactive, organized approach to treating chronic illnesses, it is not surprising to find that collaborative care can improve outcomes for both depression and other chronic illnesses with associated cost savings.[34] One RCT of a multi-condition collaborative care model that has shown improvements in both diabetes, coronary heart disease, and depression management (i.e., hemoglobin A1c, systolic blood pressure, low-density lipoprotein cholesterol, depression scores).[35] Another RCT suggested that improvements in patient diabetes and depression outcomes through multi-condition collaborative care models may be mediated by improvements in medication adherence.[36]

**Dissemination and Implementation of VA Primary Care-Mental Health Integration**

Scale-up and spread of evidence-based integrated mental health services or collaborative care is one of the most important challenges in primary care. The first positive effectiveness trials supporting integrated care were published in the 1990s and evidence continues to accumulate in favor of this type of healthcare delivery (Figure 1.1).[20,25] Despite positive findings in patient outcomes and cost-effectiveness in numerous efficacy and effectiveness trials over the past several decades, there has not been widespread implementation of integrated care, even in healthcare systems and clinics that participated in RCTs.[37] The translation of published research into widespread practice has proven to be slow, taking an average of 15 years and it appears to apply similarly to integrated care.[38]

Figure 1.1: History and Evolution of Collaborative Depression Care




Although collaborative care models undergo constant adaption, there are relatively few examples of successful large-scale dissemination of evidence-based models in real-world settings for ongoing patient care. New adaptations of collaborative care are being tested in different patient populations (e.g., pediatric, obstetrics-gynecology)[39] and through community-based participatory research approaches to decrease disparities of care in underserved minority populations.[40] Moving beyond efficacy and effectiveness studies, we currently find documented dissemination of collaborative care in large integrated healthcare delivery systems such as Kaiser Permanente[41] and Intermountain Healthcare.[42,43] This is also occurring in fee-for-services systems and federally funded clinic systems of care through Depression Improvement Across Minnesota Offering a New Direction (DIAMOND) in Minnesota, Michigan, and Hawaii.[44] Finally, we introduce the VA's pioneering effort to disseminate collaborative care, the national Primary Care - Mental Health Integration (PC-MHI) initiative,[45] on which this dissertation examines.

Beginning 2007, the VHA implemented Primary Care–Mental Health Integration (PC-MHI), which aimed "to provide high quality, collaborative mental and behavioral health care to improve the health of both individual Veterans and the Veteran population as a whole."[46] Per VHA Handbook (1160.01) Section 21, all VA clinics across the country serving 5,000 Veterans or more each year must have a "blended model that includes colocated collaborative care and care management."[47] This mandate is supported by research from a collocated collaborative care model (the White River Junction model) and a measurement-based assessment and care management model (Behavioral Health Lab [BHL] or Translating Initiatives for Depression into Effective Solutions [TIDES]).[45] PC-MHI embedded mental health specialists (e.g., psychologists, social workers, licensed mental health counselors) in primary care clinics, and promoted nurse care management[48] informed by evidence-based models such as collaborative care.[25] The initiative provided programmatic technical assistance, education and training, and data sources for quality improvement[45] to facilitate implementation.[48,49]

The goal is for primary care and PC-MHI providers to work together to provide the majority of services to primary care patients with low-to-moderate complexity mental health conditions. In contrast to traditional mental health services, PC-MHI services are delivered directly in primary care, are brief and limited in number, are delivered by mid-level providers (e.g., psychologists, social workers, licensed mental health counselors) in consultation with psychiatrists, and target common behavioral health conditions seen in primary care (i.e., depression, anxiety, alcohol misuse).[49] PC-MHI providers collaborate with primary care and other specialists to additionally support primary care management of stress, sleep disorders, pain, obesity, tobacco use and other behaviorally-sensitive problems that impact health and wellness.

VA investment in PC-MHI is notable because evidence-based integrated care models are often difficult to disseminate and implement in real-world healthcare delivery systems[38]. In addition to monitoring PC-MHI service volume using administrative data, VA's National PC-MHI Evaluation regularly surveys program implementation efforts and has demonstrated appropriate mental health staffing in primary care and a service focus on depression, anxiety, PTSD, and alcohol misuse.[50] Having a PC-MHI program in a primary care clinic has been associated with increased diagnosis of mental health disorders.[7] Patients who had not recently used VA services have been found more likely to use PC-MHI services than others.[51] Individual contact with PC-MHI programs has also been associated with improved outcomes, such as increased completion of mental health specialty (MHS) referral,[52] increased odds of PTSD diagnosis and treatment initiation,[53] lower risk of having an ED visit, hospitalization, or death,[54] and greater likelihood of depression treatment with same-day services.[55]

To date, no study has longitudinally examined clinic engagement in PC-MHI programs, nor specifically assessed whether dose-response relationship exists between the intensity of the clinic population's PC-MHI service use and healthcare quality, utilization, or cost outcomes. In this dissertation, clinic PC-MHI engagement is calculated as the number of PC-MHI service users divided by the number of primary care patients in each clinic during each year. PC-MHI service users are those who visited PC-MHI at least once during a given study year, ascertained from nationally designated electronic PC-MHI encounter codes (i.e., 534 and 539). Clinic PC-MHI engagement is conceptually like PC-MHI penetration rate, which is a national VA performance metric, but it is calculated only for VA primary care clinics in the study, irrespective of whether a clinic was required to have a significant level of PC-MHI services. This dissertation covers the creation, development, and initial validation of clinic PC-MHI

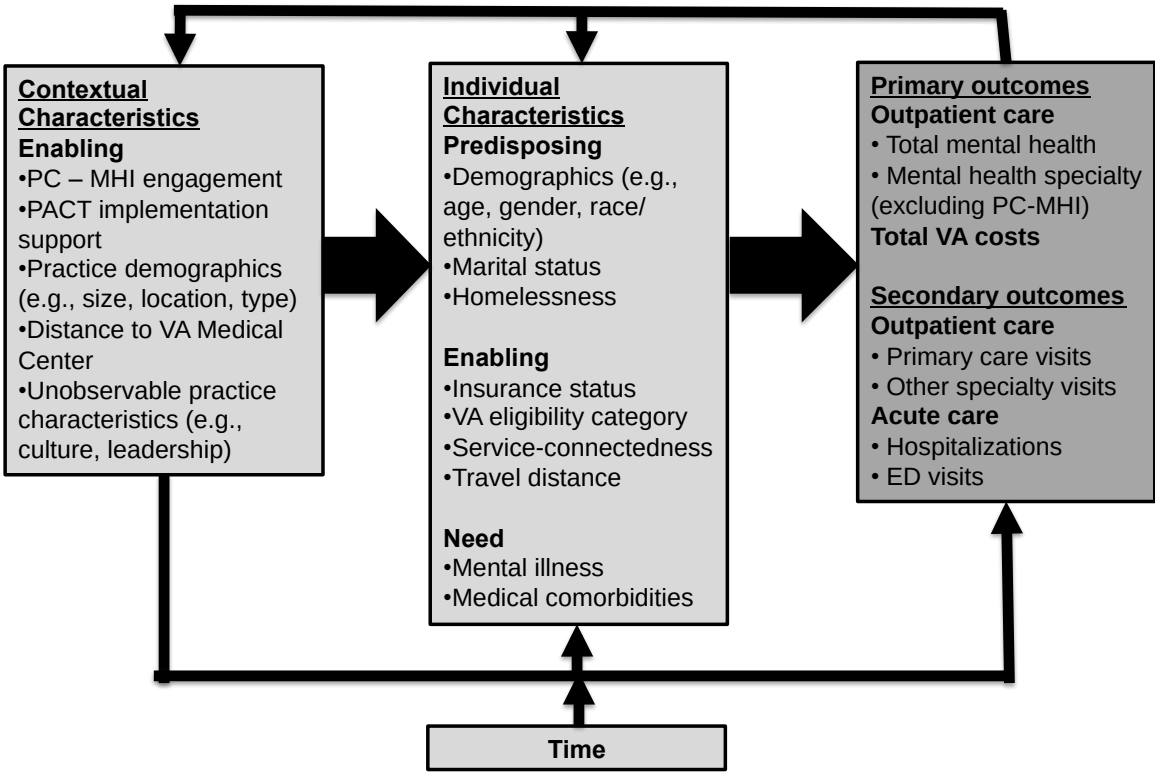
engagement, potentially a new metric for behavioral health integration in VA primary care clinics.

**Conceptual Models**

For a comprehensive framework of healthcare quality, the dissertation is based on an analytic framework put forth by the Institute of Medicine (IOM), which includes six aims for the healthcare system.[56] First is "safe" or avoiding harm to patients from well-intentioned care, which the dissertation addresses through examining patient all-cause mortality outcomes. Second is "timely" or reducing waits and potentially harmful delays for patients, which the dissertation addresses through examining realized mental healthcare access in patient mental health visit patterns. Third is "efficient" or avoiding waste, which the dissertation addresses through its study of acute care use (i.e., emergency department visits, hospitalizations). Fourth is "equitable" or providing similar levels of quality care regardless of patient characteristics, which the dissertation addresses through assessing for age, gender, racial-ethnic, and income disparities in study outcomes. Fifth is "effective" or providing evidence-based services to those who would benefit (and avoiding use in those who would not), which the dissertation addresses through examining depression care quality metrics from the VA and National Committee for Quality Assurance (NCQA). Sixth is "patient-centered" or providing care that accounts for patient preferences, needs, and values, which the dissertation does not directly address. Future research may fill additional gaps in knowledge by studying patient satisfaction, depressive symptom control, or quality of life outcomes as they relate to PC-MHI. Additional analyses on cost of VA care will inform our understanding of the overall healthcare value (i.e., patient outcomes achieved per dollar spent) of PC-MHI programs.[57]

The study conceptual model for the chapters two and three is based on Andersen's Behavioral Model of Health Services Use, which is widely used to demonstrate factors that lead to the use of health services (Figure 1.2).[58] This model displays contextual characteristics (clinic-level) of the VA and individual characteristics (patient-level) of its Veteran patients that likely impact our primary and secondary outcomes of healthcare utilization and total VA medical spending. Arrows indicate that these contextual and individual factors (and outcome variables) are often interrelated and that there may be a component of bi-directionality present.

Figure 1.2: Conceptual Model for Chapters Two and Three



Several contextual characteristics may impact our study outcomes. The main predictor is clinic PC-MHI engagement (i.e., number of PC-MHI service users divided by the number of primary care patients in a clinic each year). Another contextual characteristic is Evidence-Based Quality Improvement (EBQI) - PACT status, which reflects the staggered implementation of PACT implementation support for VA primary care practices in Southern California. Because PACT was simultaneously rolled-out throughout all VA primary care practices, we are not able to control for actual PACT status, other than adjusting for time fixed effects (pictured as a moderator). Other time-invariant contextual characteristics include those that are observable (e.g., clinic type [VA medical center versus community-based outpatient clinic], distance from "home clinic" to nearest VA medical center, practice size, location) and non-observable (e.g., clinic culture, provider/staff attitudes, leadership norms).

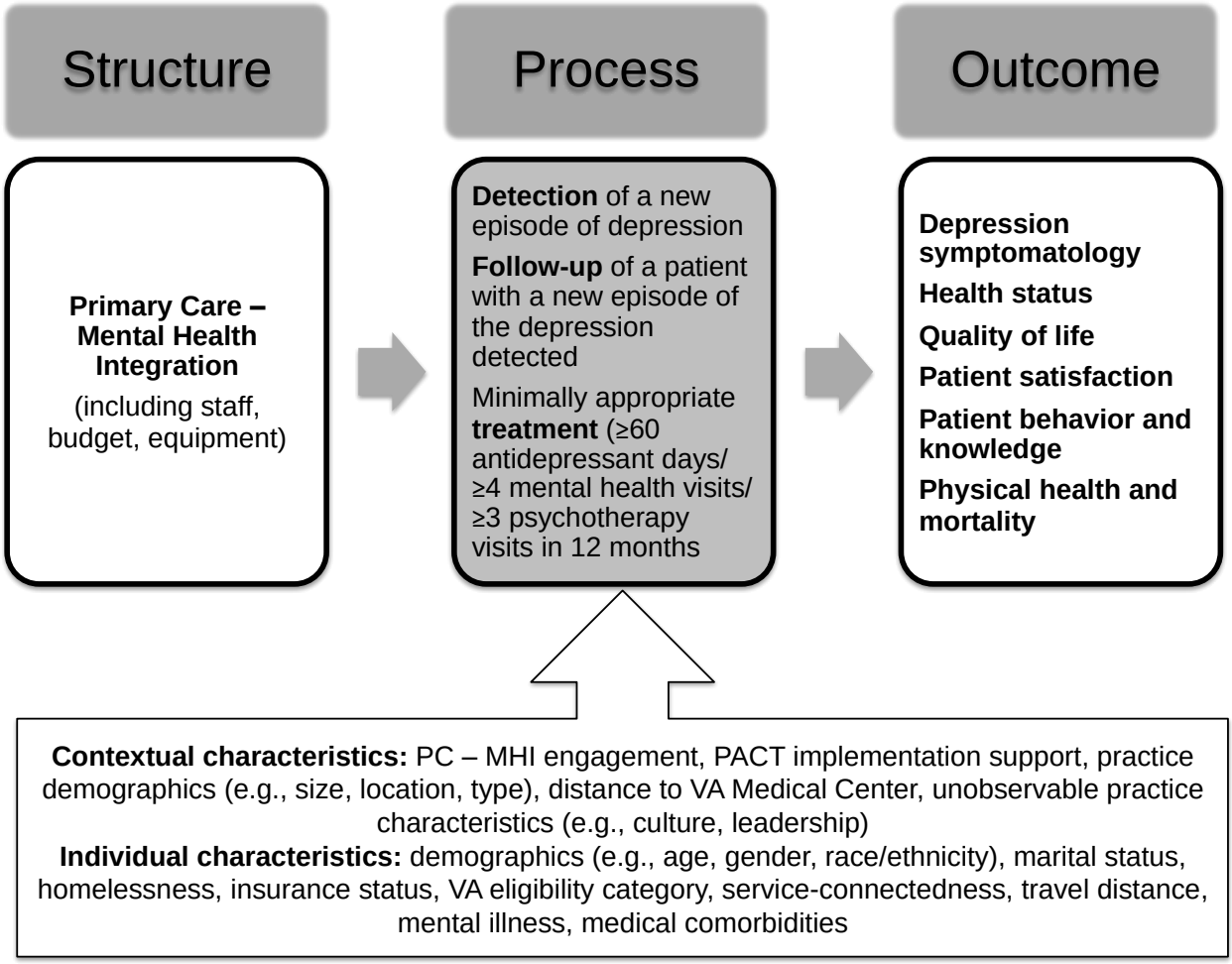
This model also addresses individual characteristics that can influence healthcare utilization. Individual predisposing factors include the demographic characteristics of age, gender, race/ethnicity, marital status, and homelessness, of which the latter two are arguably more mutable than the others. Financing factors (i.e., insurance status, VA eligibility, service-connectedness, distance from home to "home clinic") enable services utilization for VA patients. Factors related to evaluated patient needs include known mental and physical health comorbidities. Our model omits several individual factors that impact health care utilization and costs, such as individual perceived needs, culture, social structure, and health literacy.

There are some differences in the model as it applies to chapters two and three. First, the study outcomes differ – the chapter two examines the full range of healthcare utilization and costs (Figure 1.2), while chapter three takes a detailed look into mental healthcare utilization and related costs (not depicted in Figure 1.2). Second, we examine individual evaluated needs as

moderators differently – chapter two stratifies patients by varying severity of physical comorbidities, while chapter three stratifies patients by different mental health diagnoses. In sum, the chapter two is a broad, comprehensive evaluation on utilization and costs as related VA's PC-MHI initiative and chapter three delves in a targeted manner into mental healthcare utilization and costs.

Finally, the study conceptual model for chapter four is based on Donabedian's Quality of Care Model, which has guided work regarding the elements used to evaluate and compare health care quality (Figure 1.3).[59] The model contains three boxes titled "Structure", "Process", and "Outcome" and connected by unidirectional arrows in that order. Structure refers to all the factors affecting the context in which care is delivered, including the PC-MHI initiative being evaluated. Other than a national mandate, it also includes staffing, budget, equipment, etc. which is required for implementation of PC-MHI programs, in which there is wide variation across VA primary care practices. Process, on which chapter four is based, refers to the sum of all acts of healthcare delivery. This paper will focus on four depression quality of care measures based on VA and NCQA guidelines and validated by an expert panel.[18] These measures examine the diagnosis, follow-up, and treatment of new episode depression. Outcome, which contains the effects of healthcare on patients and populations (e.g., patient satisfaction, health-related quality of life, patient health status/behavior/knowledge), will not be addressed in the dissertation.

Figure 1.3: Conceptual Model for Chapter Four




**Specific Aims**

Access to high-quality mental health specialty care for primary care patients has historically been problematic. There is a lot of evidence to support behavioral health integration in primary care, especially in brief interventions for common mental illnesses (e.g., depression, anxiety) directly in primary care. Yet, dissemination and implementation of these team-based primary care models remains challenging, in part due to the lack of meaningful and valid metrics to monitor practice-level variation. In the VA, PC-MHI and primary care providers work together to provide the bulk of mental health care for primary care patients with low-to-moderate

complexity mental illnesses. This dissertation examines a new metric for clinic engagement in PC-MHI services, calculated as the number of PC-MHI service users divided by the number of primary care patients in each clinic during each year

Chapters two and three of this dissertation examines whether increased clinic engagement with PC-MHI plays a role in observed changes to mental healthcare utilization, and secondarily to the full-range of healthcare utilization and costs, within VA patient-centered medical homes. We used five years of electronic administrative patient data to evaluate the relationship between clinic PC-MHI engagement and mental healthcare utilization in a large regional cohort of VA patients.

Chapter two specific aims were:

1. To examine whether greater clinic PC-MHI engagement (i.e., through greater uptake of PC-MHI services) would be associated with more VA-provided mental health services overall and less non-primary care based MHS services
2. To secondarily examine whether greater clinic PC-MHI engagement would be associated with decreased total costs of VA care through potential effects on the full-range of healthcare utilization

Chapter three specific aims were:

1. To examine which types of non-primary care based MHS visits (i.e., general versus more specialized MHS services) were reduced by increasing clinic PC-MHI engagement over time
2. To examine which patient subgroups (i.e. patients with depression versus psychotic disorders) were affected by this reduction in MHS services

In order to ascertain whether integrated mental health care for Veterans is “high-value,” Chapters four examines the relationship between clinic engagement with PC-MHI and quality of care for individuals with PC-MHI target conditions like depression. In order to further validate our PC-MHI metric, we added five years of electronic pharmacy data to our administrative patient dataset and to evaluate the relationship between clinic PC-MHI engagement and three guideline-concordant population-based quality measures for patients newly diagnosed witha depression episode in a large regional cohort of VA patients.

Chapter four specific aims were:

1. To examine whether greater clinic PC-MHI engagement would be associated with increased follow-up of patients within 84 days and 180 days of diagnosis of a new depression episode
2. To examine whether greater clinic PC-MHI engagement would be associated with increased provision of minimally appropriate treatment for patients diagnosis of a new depression episode

## Chapter 2. Changing Patterns of Mental Healthcare Use in Veteran Affairs Primary Care

### Introduction

Managed and accountable care organizations, like the VA, strive to provide access to timely, equitable mental and physical health care for enrollees.[60] Mental health services that are physically and organizationally separate from primary care may not be able to meet the needs of a large Veteran population, heavily burdened by mental illnesses.[7] As such, the VA is uniquely positioned to leverage team-based care models that integrate physical and mental health care. These include two major national initiatives PC-MHI and Patient Aligned Care Teams [PACT] (i.e., patient-centered medical home).[61] Through both initiatives, the aim has been to provide the bulk of mental health care for primary care patients with low-to-moderate complexity mental health conditions within the medical home.[49]

Recently, researchers have observed reductions in mental health specialty (MHS) visits and total VA costs and have attributed this to PACT.[62,63] However, it remains unclear what role PC-MHI services may have played in accounting for these reductions. The association between PC-MHI and overall mental health services, however, has been mixed and depended on how PC-MHI is characterized (i.e., comparing clinics with or without PC-MHI programs,[64] comparing patients with or without a PC-MHI visit[50]). To date, no study has longitudinally examined clinic PC-MHI engagement (i.e., the intensity of the clinic population's PC-MHI service use) to understand PC-MHI's impact on healthcare utilization and costs.

We used five years of electronic administrative patient data to evaluate the relationship between clinic PC-MHI engagement and mental healthcare utilization in a large regional cohort of VA patients. We hypothesized that greater clinic PC-MHI engagement (i.e., through greater

uptake of PC-MHI services) would be associated with more VA-provided mental health services overall and less non-primary care based MHS services. We secondarily hypothesized that greater clinic PC-MHI engagement would be associated with decreased total cost of VA care through potential effects on the full-range of healthcare utilization, particularly among patients with high levels of comorbidity, whom are often high healthcare utilizers.

## Methods

### *Study Design, Setting, and Participants*

We performed a retrospective longitudinal patient cohort study from fiscal years (FY) 2009 to 2013 (October 1, 2008 – September 30, 2013). This study used data originally obtained to examine the impact of patient-centered medical home implementation using evidence-based quality improvement. Eligible patients were VA primary care users, having at least two primary care visits (based on clinic stop codes for Primary Care Medicine, Primary Care Shared Appointment, Comprehensive Women's Primary Care Clinic, or Geriatrics PACT) in the baseline year. To understand mental healthcare utilization in those with the greatest need, we chose to examine patients diagnosed with one or more of the following conditions on at least two separate encounters during the study period: alcohol use disorders, drug use disorders, depression, bipolar disorder, schizophrenia, PTSD, personality disorders, or other mental health disorders (e.g., anxiety) (n=66,638).

Study patients visited one of 29 primary care clinics (4 hospital-based, 25 community-based) in Southern California. Although most clinics had less than 5000 patients per year and were not mandated to implement PC-MHI programs, 27 of 29 clinics recorded PC-MHI

encounters during the study period, indicating robust uptake of PC-MHI services in this region. Six clinics concurrently participated in an evidence-based quality improvement intervention to facilitate PACT adoption (EBQI-PACT).[65]

*Measures*

*Data Source:* We obtained the number of outpatient encounters, hospitalizations, and costs of direct VA-provided care in each study year for each study patient from the VA's National Patient Care Databases and the Decision Support System files.

*Clinic Assignment:* We assigned each patient to a home primary care clinic site by determining where the patient received a plurality of primary care visits during the baseline year (FY2009). If there was a tie between two or more clinics, we preferentially assigned patients to community-based clinics and then, if still tied, to the most recent clinic visited for primary care.

*Main Outcomes*: Our main outcomes were 1) non-primary care based mental health specialty (MHS) visits, defined as the number of visits to a non-primary care based mental health provider for each patient (i.e., excludes PC-MHI visits), and 2) total mental health visits, defined as the sum of each patient's MHS and PC-MHI visits (Table A.2.2). Given the skewed distribution, we dropped extreme values of all mental health visits (i.e., greater than three standard deviations [~90 visits]) in each study year.

*Secondary Outcomes:* We grouped and counted all clinical visit codes related to primary care (excluding PC-MHI), non-mental health specialties, emergency department (ED) visits, and hospitalizations across all diagnoses and departments. We excluded FY2009 ED visits due to

inconsistent reporting and further subdivided ED visits (e.g., ambulatory care sensitive condition-related, mental health/substance abuse-related). We did not examine telephone, laboratory, radiology and administrative visits. We aggregated healthcare costs from all VA-sponsored care (i.e., care paid for by the VA) for each patient in each year and adjusted costs to 2013 dollars using the general consumer price index.

*Main Predictor*: Our main predictor was clinic PC-MHI engagement, defined as the number of PC-MHI service users divided by the number of primary care patients in each clinic during each year (Table A.2.1). PC-MHI service users are those who visited PC-MHI at least once during a given study year, ascertained from nationally designated electronic PC-MHI encounter codes (534, 539). For ease of interpretation in descriptive analyses, we dichotomized clinics by whether they fell above ("high PC-MHI engagement") or below ("low PC-MHI engagement") the baseline median PC-MHI engagement. Because we hypothesized that there might be a linear relationship, we used clinic PC-MHI engagement as a continuous variable in all regression analyses.

*Covariates*: Our study controlled for patient characteristics affecting healthcare utilization, including age, gender, race-ethnicity, marital status, non-VA health insurance, VA care eligibility (i.e., qualification for VA health care benefits based on duty requirements, discharge conditions, etc.), level of service-connected disability (i.e., degree to which a given injury or condition can be attributed to military service experiences), homelessness, and distance from home address to primary care clinic. We adjusted for mental health diagnoses based on *International Classification of Diseases, Ninth Revision* encounter codes and calculated the Charlson Comorbidity Index using the Deyo-Quan approach for each patient's physical comorbidities in each year.[66,67] To control for time-varying clinic characteristics, we identified

the six EBQI-PACT sites through an indicator for EBQI-PACT participation and implementation year. Additionally, we examined the following time-invariant clinic characteristics: type (i.e., hospital- vs community-based), location, and size.

*Analysis*

In descriptive analyses, we examined clinic PC-MHI engagement for each study year. We analyzed mean numbers of medical visits and healthcare costs per patient as well as the percent they changed between the baseline to final study year. Furthermore, we compared patient- and clinic-level characteristics of high and low PC-MHI engagement clinics using t- and $\chi^2$ tests at baseline. Using unadjusted regression models with indicator variables for each year, we estimated the association of PC-MHI engagement on our healthcare utilization and cost outcomes.

We used multivariable analyses to estimate the effects of clinic PC-MHI engagement on our dependent variables, controlling for utilization-related patient characteristics, clinic EBQI-PACT participation, and year and clinic fixed effects. All regression models included year and clinic fixed effects to control for any secular trends and invariant clinic characteristics. Models included patient random effects to account for the multiple non-independent observations per patient over the five study years. We adjusted standard errors for clustering of patients within clinics. To account for over-dispersion in the distributions of our healthcare utilization counts, we used multi-level negative binomial regression models and derived incidence rate ratios. To account for the skewed distribution of healthcare costs in each year, we used log-transformed costs in our multi-level linear regression models.

In sensitivity analyses, we (1) stratified patients by whether their clinics were required to have PC-MHI programs, (2) included patients without mental health diagnoses (n= 112,737), (3) separately analyzed patients with multiple chronic comorbidities (i.e., Charlson Comorbidity Index of 2 or higher) (n=18,362), (4) excluded patients who were age 65 years or older and eligible for Medicare coverage (n=21,510), and (5) excluded patients who had no visits during the final study year (i.e., left VA care) or died during the study period (n=10,203). We additionally examined if there were any mortality differences (i.e., number of patient deaths) associated with increasing clinic PC-MHI engagement. We determined significance using a two-tailed alpha of 0.05 and conducted all analyses in Stata 14.0. The Greater Los Angeles VA Institutional Review Board approved this study.

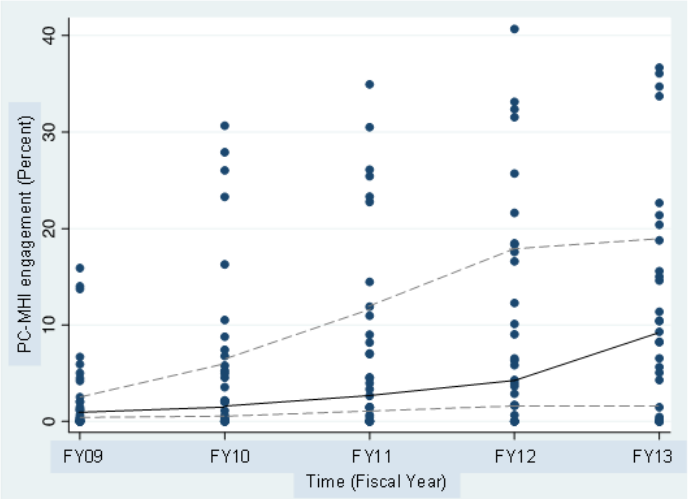
## Results

### *Unadjusted analyses*

Over five years, median clinic PC-MHI engagement across study clinics increased by 8.2 percent (Figure 2.1). We found significant baseline differences between patients in high and low PC-MHI engagement clinics (grouped per FY2009 clinic PC-MHI engagement median=1.1%; range=0%, 15.9%) (Table 2.1 & 2.2). Compared to low PC-MHI engagement clinics, high PC-MHI engagement clinics had greater patient volume, were more likely to be hospital-based, and included the one non-metropolitan clinic and all clinics participating in EBQI-PACT. Compared to patients in low PC-MHI engagement clinics, those in high PC-MHI engagement clinics were more likely to be older, chronically ill, male, Black, single, uninsured (i.e., without non-VA insurance), homeless, to live farther from their home primary care clinic, to have lower eligibility

ranking for VA care, and to less often have service-connected disabilities. High and low PC-MHI engagement clinics had similar proportions of patients with bipolar disorder and schizophrenia.

Figure 2.1: Distribution of Annual PC-MHI Engagement for each Clinic




Each point represents a PC-MHI engagement rate for one clinic in a given year. Dashed trend lines represent 25th and 75th quartiles. Solid trend line represents the median.

Table 2.1: Patient Characteristics by Clinic PC-MHI Engagement in Baseline Year

| | Percent of Patients in Low PC-MHI Engagement Clinics (n=24,120) | Percent of Patients in High PC-MHI Engagement Clinics (n=41,962) |
|---|---|---|
| **Age group** | | |
| <45 | 16% | 13% |
| 45-54 | 17% | 15% |
| 55-64 | 36% | 38% |
| 65-74 | 16% | 17% |
| 75-84 | 10% | 12% |
| 85+ | 4% | 5% |
| **Gender** | | |
| Female | 7% | 5% |
| Male | 93% | 95% |
| **Race/Ethnicity** | | |
| White | 56% | 46% |
| Black | 13% | 16% |
| Hispanic | 13% | 13% |
| Other | 6% | 3% |
| Unknown/Missing | 3% | 7% |
| Unclassified | 9% | 14% |
| **Marital Status** | | |
| Married | 45% | 39% |
| Separated/Divorced/Widowed | 38% | 39% |
| Single/Never married | 17% | 20% |
| **VA eligibility category** | | |
| Below means test/not service connected | 33% | 39% |
| Service connected | 51% | 43% |
| Above means test/copay | 11% | 13% |
| Other | 5% | 5% |
| **Service Connected Percent** | | |
| 0 | 51% | 59% |
| 1-50 | 23% | 20% |
| 51-100 | 25% | 20% |
| **Insurance** | | |
| No Insurance | 51% | 65% |
| Medicare/Medicaid | 26% | 20% |
| Private insurance | 22% | 13% |
| Other/Unknown | 1% | 1% |
| **Homeless** | | |
| No | 94% | 91% |
| Yes | 6% | 9% |
| **Charlson Comorbidity Index** | | |
| 0 | 48% | 46% |
| 1 | 25% | 26% |
| 2 | 27% | 28% |
| **Mental health diagnoses*** | | |
| Alcohol use disorder | 13% | 11% |
| Other drug use disorder | 7% | 9% |
| Depression | 36% | 33% |
| PTSD | 23% | 21% |
| Bipolar disorder† | 5% | 5% |
| Schizophrenia† | 4% | 4% |
| | **Mean (SD)** | |
| **Distance from home to clinic** | 12.5(12.2) | 13.4(13.2) |

All results had X2 or t-test p-values of <0.05, unless otherwise indicated (n=66,078)

*Total sum exceeds 100%, as patients may have multiple mental health diagnoses.

†P-value was not significant at 95% level.

Table 2.2: Clinic Characteristics by Clinic PC-MHI Engagement in Baseline Year

| Clinic-Level Characteristics | Percent of Clinics with Low PC-MHI Engagement (n=15) | Percent of Clinics with High PC-MHI Engagement (n=14) |
|---|---|---|
| **EBQI-PACT*** | | |
| Off | 100% | 64% |
| On | 0% | 36% |
| **Clinic Type** | | |
| VA medical center based | 7% | 21% |
| Community based | 93% | 79% |
| **Clinic Rurality** | | |
| Metropolitan | 100% | 93% |
| Non-metropolitan | 0% | 7% |
| **Clinic Size** | | |
| Less than 5,000 patients | 87% | 64% |
| 5,000-9,999 patients | 13% | 14% |
| 10,000 or more patients | 0% | 21% |
| | **Mean (SD)** | |
| **Distance from clinic to VA medical center†** | 44.5(52.2) | 36.9(41.7) |

All results had X2 or t-test p-values of <0.05, unless otherwise indicated (n=29)

*Based on having implemented EBQI-PACT by the end of the study period

†P-value was not significant at 95% level.

From the baseline to final study year, patients appeared to have fewer total mental health visits (-8.0%) and MHS visits (-15.0%). Patients in high PC-MHI engagement clinics used mental health services more frequently and experienced smaller reductions over time, compared to those in low PC-MHI engagement clinics. In unadjusted analyses, we found that, at any given year, patients treated at a clinic with a one percentage-point higher PC-MHI engagement rate had significantly less MHS, total mental health, primary care, and ED visits and total VA healthcare

costs; however, differences in other specialty visits and hospitalizations were not significant (Table 2.3).

*Adjusted analyses*

After adjusting for patient- and clinic-level factors, however, we found that higher clinic PC-MHI engagement was associated with lower MHS and higher total mental health visit rates. At any given year, patients treated at a clinic with a one percentage-point higher PC-MHI engagement rate was associated with a 1.0% lower MHS visit rate (CI=-1.6%, -0.3%; p=0.002) and a 0.5% higher total mental health visit rate (CI=0.18%, 0.90%; p=0.003). As such, we observed a substitution rate, at the mean, of 1.5 PC-MHI visits for each MHS visit. There was no evidence of a clinic PC-MHI engagement effect on other healthcare utilization outcomes, including primary care visits, other specialty visits, ED visits, or hospitalizations. Finally, we observed a small but non-significant reduction in total costs per year associated with clinic PC-MHI engagement (Table 2.3).

Table 2.3: Effect of Clinic PC-MHI Engagement on Healthcare Utilization and Costs

| Type of Utilization | Unadjusted | 95% Confidence Interval Lower | Upper | | Adjusted | 95% Confidence Interval Lower | Upper | |
|---|---|---|---|---|---|---|---|---|
| | Observations: (n=304,422) (except ER, n=238,340) | | | | Patients: (n=66,638) (except ER, n=65,290) | | | |
| **Ambulatory care encounters** | | | | | | | | |
| Total Mental Health | -1.9% | -2.0% | -1.8% | *** | 0.5% | 0.2% | 0.9% | *** |
| Specialty Mental Health | -1.2% | -1.4% | -1.1% | *** | -1.0% | -1.6% | -0.3% | *** |
| Primary Care | -0.3% | -0.3% | -0.2% | *** | -0.2% | -0.7% | 0.3% | |
| Specialty | 0.0% | -0.1% | 0.1% | | -0.02% | -0.3% | 0.2% | |
| **Acute Care visits/stays** | | | | | | | | |
| VA ED | -0.7% | -0.8% | -0.5% | *** | 0.5% | -0.1% | 1.0% | * |
| VA Hospitalizations | -0.1% | -0.3% | 0.1% | | 0.1% | -0.4% | 0.6% | |
| **Costs** | **β** | **SE** | | | **β** | **SE** | | |
| Log of VA health care costs† | -0.7 | 0.03 | | *** | -0.2 | 0.2 | | |

*** p<0.01, ** p<0.05, * p<0.1

We report incidence rate ratios (and confidence intervals) from multilevel negative binomial regression models predicting healthcare utilization and coefficients (and standard errors) from multilevel linear model predicting log-transformed total VA costs. Models contained fixed effects for year and clinic and random effects for patient. We adjusted each model for PACT implementation support (Evidence-Based Quality Improvement in Patient Aligned Care Team [EBQI-PACT] status), and patient characteristics (age, gender, race/ethnicity, marital status, VA eligibility, disability service connection, health insurance, homelessness, distance from home to primary care clinic, Charlson Comorbidity Index, mental health diagnoses) for the 5-year study period.

Results for several covariates in adjusted Total Mental Health model: PACT implementation support (EBQI-PACT) (difference=-0.02%; CI=-0.3%, 0.2%; p=0.02); age (difference =-0.01%; CI=-0.02%, -0.01%; p<0.001); gender (difference=-0.2%; CI=-0.2%, -0.1%; p<0.001); single (difference=0.1%; CI=0.1%, 0.2%; p<0.001); having a service-connected disability (difference=0.3%; CI=0.2%, 0.4%; p<0.001); uninsured (difference=0.1%; CI=0.02%, 0.1%; p=0.01); homeless (difference=1.2%; CI=1.1%, 1.3%; p<0.001); distance to clinic (difference=0.004%; CI=-0.01%, 0.002%); multiple chronic comorbidities (difference=0.1%; CI=0.05%, 0.1%; p=0.001); having any mental health diagnosis (e.g., depression difference= 1.1%; CI=1.1%, 1.2%; p<0.001; schizophrenia difference= 0.8%; CI=0.7%, 1.0%; p<0.001), except sociopathy (difference=-0.2%; CI=-0.3%, -0.05%; p=0.01)

We observed progressive reductions in total mental health usage over time and lower usage in clinics with PACT implementation support (i.e., EBQI-PACT) than those without. Older age and male gender were associated with lower mental healthcare utilization; however, being single/uninsured/homeless, living closer to clinic, and having a service-connected disability/multiple chronic comorbidities/any mental health diagnosis except sociopathy were

associated with higher utilization. There were no significant racial-ethnic differences in mental healthcare utilization (Table 2.3).

*Sensitivity analyses*

When we stratified analyses by whether patients belonged to a clinic mandated or not to have PC-MHI, there was no evidence of clinic PC-MHI engagement effect on MHS visits or total mental health visits in clinics where PC-MHI was required. We, however, found a significant association between clinic PC-MHI engagement and both MHS visits (difference=-1.3%; CI=-2.2%, -0.3%; p=0.01) and total mental health visits (difference=0.7%; CI=-0.4%, 1.1%; p<0.001) in clinics where it was not required (i.e., less than 5000 patients per year, but this difference was not significant when we included an interactive effect with clinic PC-MHI engagement.

Sensitivity analyses on all patients including those without mental health diagnoses, patients with multiple chronic comorbidities, patients younger than 65 years (i.e., not Medicare eligible), and patients who left VA care or died before the end of the study, yielded similar results to those reported above. Finally, we found no evidence of a PC-MHI effect on patient mortality.

**Discussion**

VA primary care clinics that were more highly engaged in PC-MHI appeared to have higher total mental health utilization, with PC-MHI substituting for MHS visits. Addressing the

need to integrate mental health resources into patient-centered medical homes,[68,69] PC-MHI appears to facilitate access to mental health services by primary care patients with mental health needs. Interestingly, there was a suggestion that this effect may even be driven by smaller clinics, where PC-MHI is not mandated but still desired. Observed study changes were specific to mental healthcare utilization and not seen in other outpatient care (i.e., other specialty, primary care). This is one of the first studies to examine clinic engagement in PC-MHI programs through the intensity of service use within a large VA primary care clinic population. Earlier studies on PC-MHI largely predated the introduction of patient-centered medical homes, characterized the effect of PC-MHI differently, and had mixed conclusions on the relationship between PC-MHI and mental healthcare utilization.[64,50] These studies were also not designed to assess access to mental health care for the primary care population. Further investigation into PC-MHI's effect on subcategories of MHS care and patient subgroups is needed to illuminate the mechanism behind PC-MHI substitution. If this substitution reflects proper assessment and triage of mental health needs of primary care patients, PC-MHI may be a viable solution for the limited capacity of non-primary care based MHS services.

Importantly, we did not observe any worse health outcomes, either in mortality, increased acute care use (i.e., ED visits, hospitalizations), or medical spending for patients in clinics with greater clinic PC-MHI engagement. Lack of change in acute care use contrasts a previous study that found an association between increased contact with care management and increased ED visits.[70] Furthermore, our study found that higher clinic PC-MHI engagement had a small, non-significant reduction in total cost of care, in some contrast to other studies demonstrating modest additional costs but overall cost-effectiveness of collaborative care in other settings.[41,42] To fully understand the financial burden of these services and whether they can be deemed as high value

care, however, requires a more comprehensive cost-analysis that includes program implementation and operation costs.

## Chapter 3. Shifting Mental Health Services for Common Mental Illnesses to Veteran Affairs Primary Care

### Introduction

Because PC-MHI is designated as a lower-level service on the spectrum of intensity of VA mental health care, it remains unclear whether decreasing non-primary care based MHS visits (i.e., PC-MHI substitution), as described in the previous chapter, reflects good mental health care for primary care patients. PC-MHI services have demonstrated effectiveness for common conditions amenable to primary care-based treatment (i.e., depression)[71] and are not meant to serve as gatekeeper or to replace outpatient VA MHS services. In contrast to PC-MHI, MHS services are provided outside of primary care, emphasize chronic care for individuals with serious mental illness (SMI), and employ a full-range of mental health specialists. VA MHS services occur on a continuum as follows: general team-based mental health, specialty outpatient programs, and residential rehabilitation and treatment programs. PC-MHI, however, utilizes mental health staff in a collaborative model, often with psychiatrist consultation, to treat patients with mild-to-moderate conditions like depression, anxiety, and alcohol misuse. It is, therefore, important to rule out whether the reduction in MHS services is indiscriminate or even encroachment of care for SMI individuals in primary care.

Our study aims were to understand (1) which types of non-primary care based MHS visits are reduced by increasing clinic PC-MHI engagement over time, and (2) which patient subgroups are affected by this reduction. First, we hypothesized that greater primary care clinic PC-MHI engagement would only be associated with lower use of general MHS visits and not more specialized MHS services (e.g., services for SMI individuals). Second, we hypothesized that patients with depression, a PC-MHI target condition, would receive fewer general MHS services,

as a primary care clinic engages more fully in PC-MHI. Since patients with psychosis (i.e., bipolar disorder, schizophrenia) may be best managed through non-primary care based MHS services, we hypothesized no change in the use of MHS services for these patients, in relation to primary care clinic engagement in PC-MHI.

## Methods

### *Study design and cohort*

As described in the previous chapter, we performed a retrospective longitudinal cohort study from October 1, 2008 to September 30, 2013 with the same cohort of Southern California VA primary care patients with mental health diagnoses (n=66,638).

### *Measures*

*Primary Outcomes*: We used nationally designated electronic encounter codes from National Patient Care Databases to subdivide outpatient VA mental health care as follows: PC-MHI, general MHS, and more specialized MHS care (Table A.2.2). Since our study focused on understanding the reduction of MHS services, we did not examine PC-MHI services as an outcome. Our primary outcomes included the number of MHS visits per patient, subdivided into 1) general MHS (i.e., general mental health team-based care providers), and 2) more specialized MHS (i.e., specialty outpatient programs, residential rehabilitation and treatment programs). We analyzed more specialized MHS visits pooled together and separately as different categories:

SMI, homeless, substance use disorder, PTSD, day hospitalization, rehabilitation, primary care in mental health, geriatric, home-based, sexual trauma, and chaplain services.

*Primary Predictor*: We previously detailed that our main predictor was clinic PC-MHI engagement, which we defined as the number of PC-MHI service users divided by the number of primary care patients in each clinic in each year.

*Covariates*: As detailed in the previous chapter, we controlled for the utilization-related patient and clinic characteristics: age, gender, race-ethnicity, marital status, health insurance, income-proxies (i.e., patients may be eligible for VA care based on a means test and/or service-connected disability), homelessness, distance from home address to home clinic, mental health diagnoses, Charlson Comorbidity Index, and EBQI-PACT.

*Analysis*

In descriptive analyses, we examined the relative proportions of mental health diagnoses among study patients in all clinics for each study year. Next, we examined the proportion of mental health diagnoses among patient users of different types of mental health care over the 5-year study period. We used t-tests to compare the mean numbers of mental healthcare visit types by each mental health diagnosis. We additionally stratified by low versus high PC-MHI engagement clinic categories and used $\chi^2$ tests to compare the proportions of mental health diagnoses by low versus high PC-MHI engagement. Finally, we used unadjusted regression models with year fixed effects to estimate the relationship between clinic PC-MHI engagement and mental healthcare utilization outcomes across all study years.

In multivariable analyses, we estimated the effect of clinic PC-MHI engagement on mental healthcare utilization outcomes for all study patients, after adjusting for year and clinic fixed-effects, other clinic interventions (i.e., EBQI-PACT participation), and utilization-related patient characteristics. Then, we separately analyzed patients with depression (n=37,616) and patients with psychosis (i.e., bipolar disorder, schizophrenia) (n=7,662). Additionally, we analyzed a pooled sample of both patient subgroups with variables for diagnostic type (i.e., depression, psychosis) to determine if either had an interactive effect with clinic PC-MHI engagement. We included year and clinic fixed effects to account for secular trends and invariant clinic characteristics and included patient random effects due to having multiple non-independent observations per patient over the five study years. Additionally, we adjusted standard errors for clustering of patients within clinics.[72] To account for over-dispersion in the distributions of our healthcare utilization outcomes, we used multi-level negative binomial regression in unadjusted and adjusted models and reported incidence rate ratios.

In sensitivity analyses, we (1) stratified patients by whether their clinics were required to have PC-MHI programs (mandated if clinics have 5000 or more patients per year), (2) excluded patients who were age 65 years or older and eligible for Medicare coverage (n=21,569), (3) excluded patients who had no visits during the final study year (i.e., left VA care) or died during the study period (n=13,499). In additional analyses, we examined whether clinic PC-MHI engagement had an effect on VA-directly provided mental healthcare costs, which we obtained from the Decision Support System files. We used log-transformed costs in a multi-level linear regression model to account for the skewed distribution of mental healthcare costs in each year. For all models, we determined significance using a 2-tailed alpha of 0.05 and analyzed data in

Stata 14.0. The VA Greater Los Angeles Institutional Review Board approved this study (PCC 2013-101432).

## Results

*Unadjusted analyses*

Table 3.1 depicts the proportion of mental health diagnoses among study patients in all clinics during the baseline study year; the pattern remained similar over five years. Consistently, the most common mental health diagnoses given to Veterans were depression (35%), anxiety (36%), and PTSD (22%). Our patients, on average, had 1.2 mental health diagnoses, indicating that co-morbid illnesses were common. We found significant differences between patients in clinics with high versus low PC-MHI engagement. There were more substance use disorders ($\chi^2$=159; df=1; p<.001), anxiety ($\chi^2$=74.9; df=1; p<.001), and schizophrenia ($\chi^2$=8.1; df=1; p<.01) diagnosed in high PC-MHI clinic patients and more depression ($\chi^2$=62.3; df=1; p<.001), PTSD ($\chi^2$=27.1; df=1; p<.001), and alcohol use disorders ($\chi^2$=28.5; df=1; p<.001) diagnosed in low PC-MHI clinic patients.

Table 3.1: Prevalence of Mental Health Diagnoses by Clinic PC-MHI Engagement in Baseline Year

| | All Clinics | | Low PC-MHI engagment clinics | | High PC-MHI engagment clinics | |
|---|---|---|---|---|---|---|
| **Mental health diagnosis** | **N** | **%** | **N** | **%** | **N** | **%** |
| Alcohol use disorder | 8243 | 0.123 | 3206 | 0.133 | 5037 | 0.118 |
| Substance use disorder | 5781 | 0.087 | 1655 | 0.068 | 4126 | 0.097 |
| Personality disorder | 952 | 0.014 | 304* | 0.013 | 648* | 0.015 |
| Depression | 23052 | 0.345 | 8822 | 0.365 | 14230 | 0.334 |
| Post-traumatic stress disorder | 14724 | 0.221 | 5605 | 0.232 | 9119 | 0.214 |
| Bipolar disorder | 3265 | 0.049 | 1211* | 0.05 | 2054* | 0.048 |
| Schizophrenia | 2628 | 0.039 | 884 | 0.037 | 1744 | 0.041 |
| Other, including Anxiety | 23945 | 0.359 | 8164 | 0.337 | 15781 | 0.37 |
| Total diagnoses | 82590 | | | | | |
| Total patients | 66749 | | | | | |
| Number of diagnoses per patient | 1.2 | | | | | |

All differences between low and high Primary Care - Mental Health Integration (PC-MHI) clinics are significant at the 95% level, unless indicated by *.

When we examined the proportion of mental health diagnoses among patients using different types of mental health care over five years, we found that PC-MHI target conditions were more often associated with patients who visited PC-MHI than general MHS (Table 3.2). PC-MHI services users more often had depression (30.6% vs 26.7%; p<.001), anxiety (26.6% vs 23.3%; p<.001), and PTSD (21.4% vs 20.9%; p<.001) diagnoses, while general MHS service users more often had bipolar disorder (5.7% vs 4.1%; p<.001) and schizophrenia (4.7% vs 2.5%; p<.001) diagnoses. These differences remained when we stratified results by high versus low clinic PC-MHI engagement.

Table 3.2: Mental Health Diagnoses Associated with Mental Health Visits by Clinic PCMHI Engagement

| | All Clinics | | | Low PC-MHI engagement clinics | | | High PC-MHI engagement clinics | | |
|---|---|---|---|---|---|---|---|---|---|
| | All visits | PC-MHI | General MHS | All visits | PC-MHI | General MHS | All visits | PC-MHI | General MHS |
| **Associated mental health diagnosis** | No of visits (%) | No of visits (%) | No of visits (%) | No of visits (%) | No of visits (%) | No of visits (%) | No of visits (%) | No of visits (%) | No of visits (%) |
| Alcohol use disorder | 519570 (11.1%) | 10676 (7.3%) | 139292 (7.8%) | 65921 (11%) | 485 (7%) | 22894 (7%)* | 453649 (11%) | 10191 (7%) | 116398 (8%)* |
| Substance use disorder | 625481 (13.3%) | 8530 (5.8%) | 143745 (8.1%) | 54167 (9%) | 376 (6%) | 16929 (5%)* | 571314 (14%) | 8154 (6%) | 126816 (9%)* |
| Personality disorder | 116483 (2.2%) | 116483 (2.2%) | 48006 (2.4%) | 12890 (2%) | 147 (2%)* | 6425 (2%) | 103593 (3%) | 2721 (2%)* | 41581 (3%) |
| Depression | 1080262 (23%) | 45029 (30.6%) | 475565 (26.7%) | 153779 (25%) | 1990 (30%) | 87103 (27%)* | 926483 (23%) | 43039 (31%) | 388462 (27%)* |
| Post-traumatic stress disorder | 892611 (19%) | 31412 (21.4%) | 372526 (20.9%) | 146062 (24%) | 1481 (22%) | 83332 (26%) | 746549 (18%) | 29931 (21%) | 289194 (20%) |
| Bipolar disorder | 238143 (5.1%) | 6058 (4.1%) | 101701 (5.7%) | 31308 (5%) | 369 (5%) | 18362 (6%) | 206835 (5%) | 5689 (4%) | 83339 (6%) |
| Other, including Anxiety | 960503 (20.4%) | 39174 (26.6%) | 413954 (23.3%) | 24135 (4%) | 171 (3%) | 11616 (4%) | 242600 (6%) | 3205 (2%) | 72668 (5%) |
| Schizophrenia | 266735 (5.7%) | 3376 (2.3%) | 84284 (4.7%) | 125395 (20%) | 1691 (25%) | 74575 (23%) | 835108 (20%) | 37483 (27%) | 339379 (23%) |
| | 4699788 | 147123 | 1779073 | 613657 | 6710 | 321236 | 4086131 | 140413 | 1457837 |

All differences between Primary Care - Mental Health Integration (PC-MHI) and General Mental Health Specialty (MHS) visits are significant at the 95% level, unless indicated by *.

All differences between low and high PC-MHI engagement clinics are significant at the 95% level, unless indicated by *.

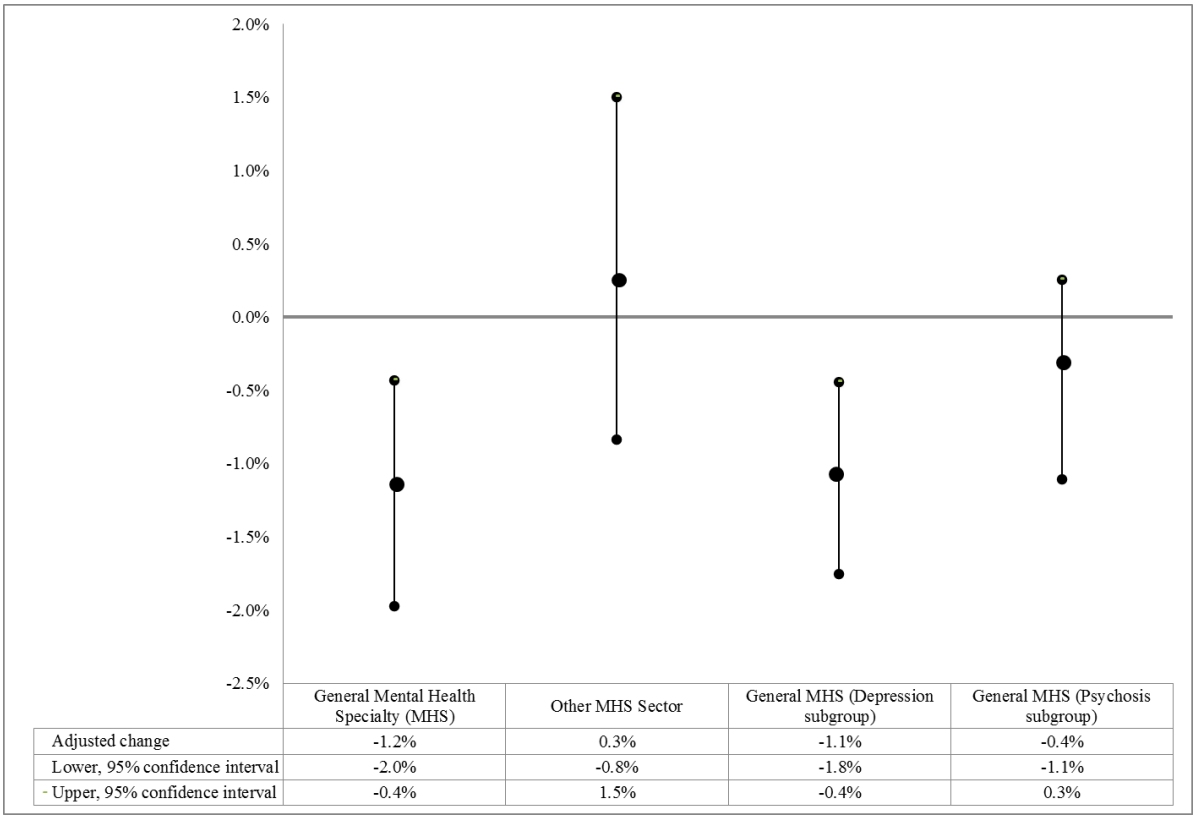
Despite a decrease in all mental health visits over five years (-19.8%), there was a large increase in PC-MHI visits in descriptive analyses (five-fold). Notably, general MHS visits decreased in high PC-MHI clinics (-6.1%) and increased in low PC-MHI clinics (37.3%). In unadjusted analyses, treatment at a clinic with one percentage-point higher PC-MHI engagement rate was associated with a 1.5% lower general MHS visit rate (95% confidence interval [CI] = -1.6 to -1.4; p=<.001) and 2.2% lower more specialized MHS visit rate (CI= -2.5 to -2.0; p=<.001) per year.

*Adjusted analyses*

We found a reduction in effect size of PC-MHI on outcomes in adjusted analyses compared to unadjusted analyses, likely due to significant differences we previously identified in high versus low PC-MHI clinics and their patients. Thus, after controlling for patient- and clinic-level factors, we found that treatment at a clinic with one percentage-point higher PC-MHI engagement rate was associated with a 1.2% lower general MHS visit rate (CI=-2.0% to -0.4%; p<.001) per year. However, there was no evidence of a PC-MHI effect on more specialized

MHS visit outcomes (0.3%; CI= -0.8%-1.5%; p=.58) pooled together or analyzed separately (Figure 3.1).

Figure 3.1: Effect of Clinic PC-MHI Engagement on Mental Healthcare Utilization




We report incidence rate ratios from multilevel negative binomial regression models predicting healthcare utilization. Models contained fixed effects for year and clinic and random effects for patient. We adjusted each model for year, PACT implementation support (i.e., Evidence-based Quality Improvement in Patient Aligned Care Teams [EBQI-PACT] participation), and patient characteristics (age, gender, race/ethnicity, marital status, VA eligibility, disability service connection, health insurance, homelessness, distance from home to primary care clinic, Charlson Comorbidity Index, mental health diagnoses) for the 5-year study period. Sensitivity analyses for patients with depression and with psychosis excluded mental health diagnoses as a covariate.

Additionally, we found a decreasing trend in general MHS visits over time [data not shown]. Several patient characteristics were associated with lower general MHS utilization:

older age, male gender, black race, Hispanic ethnicity, and longer distance to clinic. Others were associated with higher general MHS utilization: single, having a service-connected disability, homeless, multiple chronic comorbidities, and having any mental health diagnosis. Covariate results were similar for more specialized MHS visits, except that male gender, black race, and Hispanic ethnicity positively predicted use and clinic participation in EBQI-PACT negatively predicted use.

When we stratified patients by mental health diagnoses, we found differences between patients with depression and patients with psychosis (i.e., bipolar disorder, schizophrenia). We observed an association between clinic PC-MHI engagement and general MHS utilization when we restricted our sample to patients with depression, which, in most cases, is a condition ideally treated in PC-MHI (difference= -1.1%, CI= -1.8%. to 1.4%; p=.01). This association was not present when we restricted our sample to patients with psychosis, which are conditions that generally require management through MHS services (difference= -0.4%; CI= -1.1%-0.3%; p=.22) (Figure 3.1). The difference between patient subgroups, however, was not statistically significant when we included an interactive effect with clinic PC-MHI engagement.

*Sensitivity and additional analyses*

We saw some indications of a difference between patients who belonged to clinics required or not required to have PC-MHI, but the difference was not significant after we included an interactive effect with clinic PC-MHI engagement. The association between PC-MHI engagement and general MHS visits existed for PC-MHI non-mandated clinics (difference= -1.5%; CI= -2.6% to -0.3%; p=.01) and not for PC-MHI mandated clinics.

Multivariable analyses yielded similar estimates when we excluded (1) patients older than 65 years and (2) patients who left VA care and patients who died before the end of the study period [data not shown]. We observed a small but non-significant reduction in mental health costs per year associated with increasing clinic PC-MHI engagement ($\beta$= -.20, SE=.23, p=.387).

**Discussion**

In our study, we observed increasing clinic engagement in PC-MHI services over time, accompanied by a reduction in general MHS visits but no change in more specialized MHS services. There appears to be a shift in location where Veterans receive mental health care (i.e., from general MHS to primary care), which may indicate achievement of PC-MHI goals (e.g., collaborative care) or may be the product of reduced MHS availability (e.g., relative loss or reassignment of MHS staff in the VA). In either scenario, PC-MHI appears to be filling a need for mental health expertise in the primary care population. An earlier VA study similarly concluded that usage of PC-MHI programs has expanded in the VA, and that these services were reaching patients new to the VA or with a gap in healthcare utilization.[51] Primary care is often the *de facto* provider of mental health care[14,20] and other healthcare delivery systems have similarly attempted to integrate primary care and mental health.[43,44] As such, these observed changes in mental healthcare utilization may also apply beyond the VA.

PC-MHI targets the most common mental illnesses (e.g, depression), faced by VA primary care patients. There is ample evidence to support integrated mental health services for mild-to-moderate depression and anxiety in primary care.[25] Team-based primary care models, such as PC-MHI and PACT, aim to provide the majority of the mental health care needed by

primary care patients with low-to-moderate complexity mental health conditions.[49] Our findings suggest that those patients are, indeed, receiving PC-MHI services, especially in clinics that more highly engaged in PC-MHI. Future research should examine what is a suitable role for PC-MHI in the care of individuals with SMI.

## Chapter 4. Effect of Integrated Mental Health Services on Depression Quality of Care in Veterans Affairs Primary Care

### Introduction

Primary care patients have a high burden of depression and often suffer serious health consequences, as a result. Depression ranks 3rd in chronic conditions (and 1st in mental illness) diagnosed in primary care.[73] Among Veterans, approximately 12% who use VA primary care have symptoms of major depression.[74] Experts cite that half of patients with depression remain undiagnosed.[3] Veterans with mental health diagnoses, like depression, tend to use more inpatient and outpatient healthcare and are often 2.7 times more expensive than those without such diagnoses.[9] Alarmingly, patients with comorbid depression are dying 10 to 20 years earlier from their chronic medical illnesses.[6]

VA's PC-MHI initiative aims to ensure that Veterans identified with depression are assessed, treated, followed frequently, and receive self-management support through an evidence-based collaborative care model for depression.[38,44] Previous research has shown that primary care patients who had positive depression screening and received same-day PC-MHI services were more likely to initiate depression treatment than patients who received only primary care services.[55] Studies have also demonstrated positive associations between individual patient contact with PC-MHI services and patient mental health diagnosis,[7,53] MHS treatment initiation,[52,53,55] acute care use,[54] and mortality.[54] Yet, due to the dearth of meaningful and valid quality measures,[75] we do not know if variation in clinic implementation of such team-based models of care (i.e., clinic-level engagement in PC-MHI services) will have similar effects.

As described in previous chapters, we recently developed a measure for clinic PC-MHI engagement and found that greater clinic PC-MHI engagement appeared to increase realized

mental healthcare accessibility for Veterans with depression in primary care. We observed that PC-MHI substituted for non-primary care based mental health services, thereby shifting mental health care for common mental illness like depression into the patient-centered medical home. As a result, understanding the relationship between clinic PC-MHI engagement and depression quality of care is a crucial next step in validating this quality metric. To date, no one has studied whether greater primary care clinic engagement in PC-MHI services, as opposed to individual engagement of these services, improves guideline adherence and produces higher quality of care for PC-MHI target conditions like depression.

We used five years of electronic administrative patient and pharmacy data to evaluate the relationship between clinic PC-MHI engagement and depression quality of care in a large regional cohort of VA patients. We hypothesized that greater clinic PC-MHI engagement (i.e., through greater uptake of PC-MHI services) would be associated with increased diagnosis of new depression episodes and improvements in three guideline-concordant population-based quality metrics for patients newly diagnosed with depression: (1) follow-up of these patients within 84 days of diagnosis, (2) follow-up of these patients within 180 days of diagnosis, and (3) provision of minimally appropriate treatment for these patients. We secondarily hypothesized that any observed PC-MHI effect on depression care quality would be greatest in more vulnerable primary care patients (i.e., multiple chronic comorbidities, age 65 years or older, co-existing mental illnesses).

## Methods

### *Study design and cohort*

As described in the previous chapter, we performed a retrospective longitudinal cohort study from October 1, 2008 to September 30, 2013 with the same cohort of Southern California VA primary care patients, initially including all patients with and without mental health diagnoses (n=112,737). In these analyses, we had to exclude data from one to the primary care practice due to sparse data (or empty cells in regression analyses). We then only examined individuals who were "continuously seen" in a primary care, defined as having visited their primary care site at least once 12 months before and at least once after the initial visit for each fiscal year (n=81,181). Of these patients, we constructed depression quality metrics for individuals who did not already receive an *International Classification of Diseases, Ninth Revision (ICD-9)* depression diagnosis or one of the following treatments within a six-month "wash-out period" before the initial primary care visit: 60 or more days of antidepressant prescriptions, four or more mental health specialty (MHS) visits, and three or more psychotherapy visits (n=12,663).

*Measures*

*Primary Outcomes*: Using existing VA electronic medical record and prescription data from the National Patient Care Databases and the Pharmacy Benefits Management Database, we constructed and used three tested population-based quality metrics for depression care.[18,76] These metrics were developed based on prior quality measures from the VA and NCQA guidelines and separately validated by a VA expert panel.[18] We constructed depression measures from FY 2010 to 2013 for each cohort patient. For individuals with multiple new episodes of new depression, we did not construct depression measures during years that overlapped with the

wash-out period which was used to identify a new episode of depression (i.e., a patient may have new depression identified during FY 2010 and 2012, but not FY 2010 and 2011).

To start, we isolated individuals in whom a new episode of depression was diagnosed, defined as a clinic visit with an ICD-9 depression diagnosis or any antidepressant prescription in the 12-month period after the initial visit. Then, following NCQA measures, we constructed measures 1 and 2 based on follow-up of patients with new episode of depression within 84 days and 180 days of the newly diagnosed episode. Appropriate follow-up was defined as three or more mental health visits, three or more psychotherapy visits, or three or more primary care visits with a depression ICD-9 diagnosis. Finally, measure 3 assessed provision of minimally appropriate treatment for patients with a new episode of depression. Minimally appropriate treatment was defined as having 60 or more days of antidepressant prescriptions (i.e., indicating at least one medication refill), four or more mental health specialty (MHS) visits, and three or more psychotherapy visits within 12 months of diagnosis. We excluded prescriptions with a subtherapeutic dose and with non-depression indications or keywords written on the dosing instructions. For each measure, we used a denominator containing only the subset of patients to whom the measure is applicable.

*Primary Predictor*: We previously detailed that our main predictor was clinic PC-MHI engagement, which we defined as the number of PC-MHI service users divided by the number of primary care patients in each clinic in each year.

*Covariates*: As detailed in the previous chapter, we controlled for the utilization-related patient and clinic characteristics: age, gender, race-ethnicity, marital status, health insurance, income-proxies (i.e., patients may be eligible for VA care based on a means test and/or service-

connected disability), homelessness, distance from home address to home clinic, mental health diagnoses, Charlson Comorbidity Index, and EBQI-PACT.

*Analysis*

In descriptive analyses, we examined the rate of diagnosis of a new episode of depression and the three depression care quality outcome measures among study patients in all clinics for each study year. Next, we compared each outcome by low versus high clinic PC-MHI engagement using $\chi^2$ tests. Finally, we used unadjusted regression models with year fixed effects to estimate the relationship between clinic PC-MHI engagement and outcome measures across all study years.

In multivariable analyses, we estimated the effect of clinic PC-MHI engagement on the diagnosis of a new episode of depression for individuals who were "continuously seen" in a primary care, after adjusting for year and clinic fixed-effects, other clinic interventions (i.e., EBQI-PACT participation), and utilization-related patient characteristics. For individuals who were newly diagnosed to have depression, we estimated the effect of clinic PC-MHI engagement on depression quality measures (i.e., follow-up within 84 days and 180 days and minimally appropriate treatment for patients with new episode of depression) in fully adjusted multivariable analyses. We included year and clinic fixed effects to account for secular trends and invariant clinic characteristics and included patient random effects due to having multiple non-independent observations per patient over the five study years. Additionally, we adjusted standard errors for clustering of patients within clinics.[72]

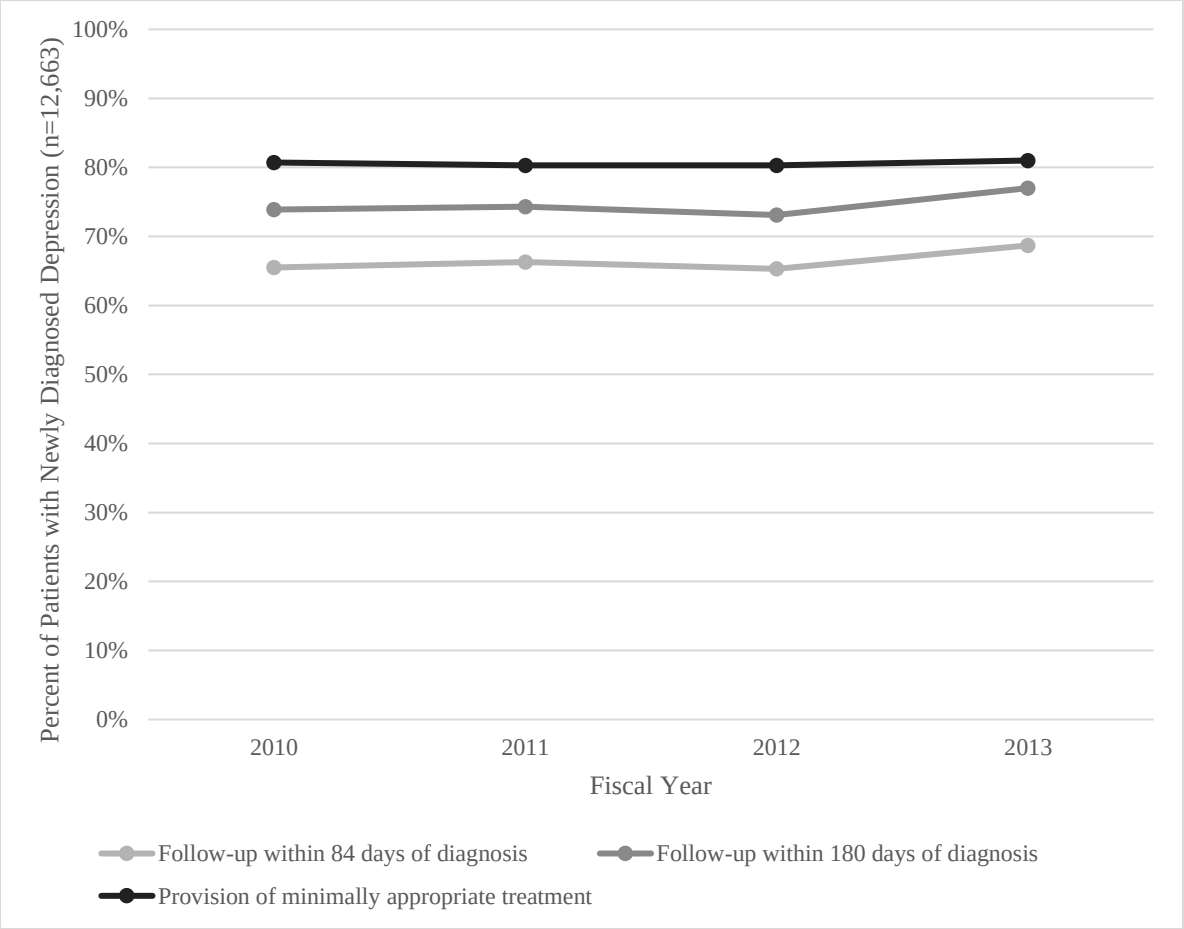
To model dichotomous outcomes, we used multi-level logistic regression models in unadjusted and adjusted analyses and reported predicted probabilities (and odds ratios in appendices) and standard errors calculated using the Delta-method. In sensitivity analyses, we compared our models to the following regression models: logistic (with clinic random effects, alternatively), probit, and linear probability. We separately analyzed the following patient subgroups: (1) patients with multiple chronic comorbidities (i.e., Charlson Comorbidity Index of 2 or higher) (n=4,073), (2) patients who were age 65 years or older (n=3,662), and (3) patients with co-morbid mental health diagnoses (e.g., anxiety disorder, post-traumatic stress disorder, substance use disorder) (n=8,546). For all models, we determined significance using a 2-tailed alpha of 0.05 and analyzed data in Stata 15.0. The VA Greater Los Angeles Institutional Review Board approved this study (PCC 2013-101432).

**Results**

In descriptive statistics, we identified significant trends in depression diagnosis and quality of care among study patients in all clinics over four years (Figure 4.1 and Figure A.4.1). From FY 2010 to 2013, rates of diagnosis of a new episode of depression decreased from 7.6% to 6.4% ($\chi^2$=81.8; p<0.001) [data not shown]. Rates of patient follow-up within 84 days and 180 days post-diagnosis increased from, respectively 65.5% to 68.7% ($\chi^2$=9.9; p=0.02) and 73.9% to 77.0% ($\chi^2$=13.1; p<0.01). We observed no difference in rates of providing minimally appropriate treatment for patients with a new episode of depression ($\chi^2$=0.9; p=0.9).

Figure 4.1: Quality of Care Over Time for Patients with Newly Diagnosed with Depression

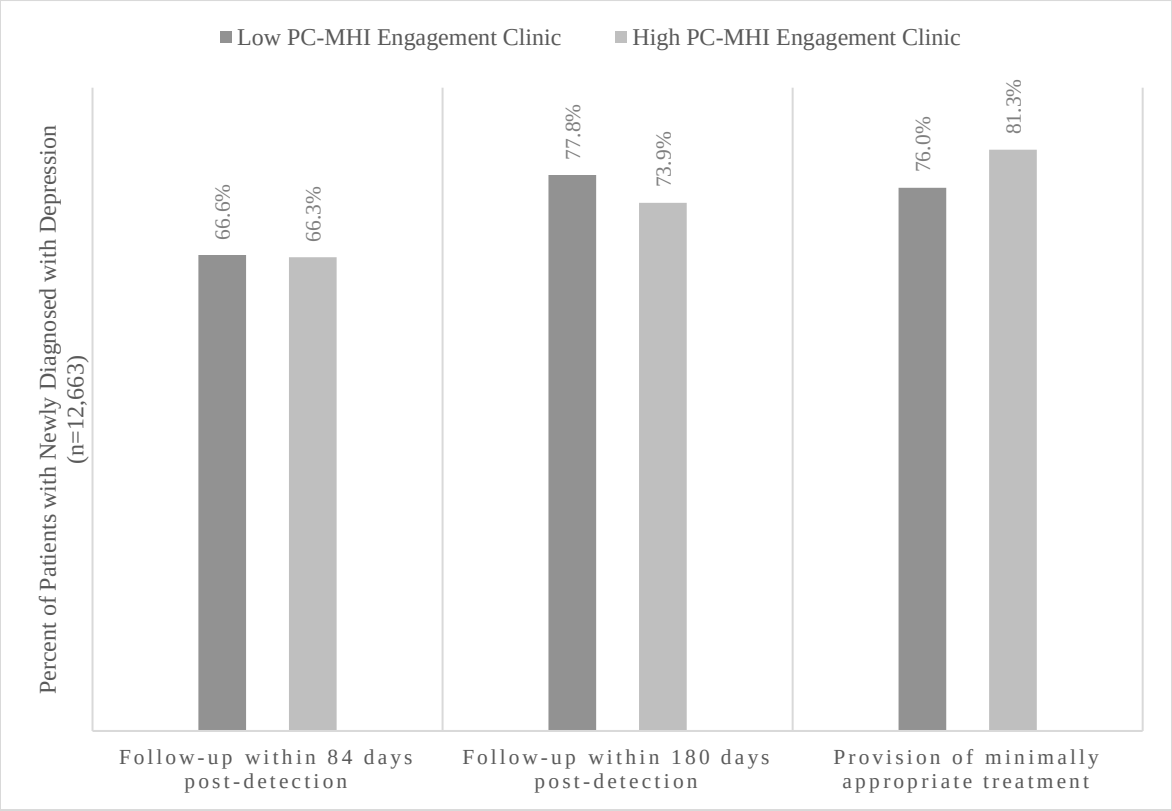
We also found significant but mixed differences in depression diagnosis and quality of care by home




clinic PC-MHI engagement status (Figure 4.2). Clinics with high PC-MHI engagement had higher rates of new episode depression diagnosis (6.9% vs 6.2%; $\chi^2$=17.0; p<0.001) [data not shown] and of providing minimally appropriate treatment (81.3% vs 76.0%; $\chi^2$=29.0; p<0.001) than clinics with low PC-MHI engagement. High PC-MHI engagement clinics had lower rates of follow-up within 180 days of diagnosis than clinics with low PC-MHI engagement (73.9% vs

77.8%; $\chi^2$=12.9; p<0.001); however, there was no difference in rates of follow-up within 84 days of diagnosis (66.3% vs 66.6%; $\chi^2$=0.1; p<0.001).

Figure 4.2: Quality of Care for Patients with Newly Diagnosed with Depression by Clinic PC-MHI Engagement




We did not find a PC-MHI effect on depression diagnosis and quality of care in our study patients in both unadjusted and adjusted analyses. In unadjusted analyses, clinic PC-MHI engagement was not associated with differences in probability of diagnosis of new episode of depression (Change in predicted probability from clinic with 0% to 100% PC-MHI engagement [ΔP] = -0.3%[0.8%]; p=0.61), patient follow-up within 84 days (ΔP = 3.6%[5.7%];p=0.52) and 180 days of diagnosis (ΔP = -0.9%[5.2%]; p=0.87), and providing minimally appropriate

treatment for patients with a new episode of depression (ΔP = 3.6%[4.8%]; p=0.46). In fully adjusted regression models, clinic PC-MHI engagement was still not associated with differences in probability of diagnosis of new episode of depression (ΔP =0.03%(1.8%); p=0.99), patient follow-up within 84 days (ΔP = -23.0%[17.5%]; p=0.19) and 180 days of diagnosis (ΔP = -14.2%[14.9%]; p=0.34), and providing minimally appropriate treatment for patients with a new episode of depression (ΔP = 20.7%[26.9%]; p=0.44) (Table 4.1 and Table A.4.1).

Table 4.1: Effect of Clinic PC-MHI Engagement on Depression Quality of Care

| | Diagnosis of a new depression episode | | Follow-up within 84 days of dianosis | | Follow-up within 180 days of diagnosis | | Provision of minimally appropriate treatment | |
|---|---|---|---|---|---|---|---|---|
| | ΔP (%) | SE | ΔP (%) | SE | ΔP (%) | SE | ΔP (%) | SE |
| **Clinic PC-MHI Engagement** | 0.15 | (1.88) | -23.04 | (17.53) | -14.24 | (14.87) | 20.69 | (26.94) |
| **EBQI-PACT** | 0.09 | (0.43) | -1.00 | (1.74) | -0.94 | (1.12) | 0.63 | (2.00) |
| **Fiscal Year** | | | | | | | | |
| 2010 | --- | --- | --- | --- | --- | --- | --- | --- |
| 2011 | -0.62*** | (0.14) | 0.87 | (1.30) | 0.27 | (1.19) | -1.35 | (1.18) |
| 2012 | -0.88*** | (0.19) | 0.16 | (1.76) | -0.97 | (1.31) | -2.02* | (0.93) |
| 2013 | -1.43*** | (0.26) | 3.09 | (2.10) | 2.22 | (1.79) | -2.37 | (2.11) |
| **Age** | -0.11*** | (0.01) | -0.10* | (0.04) | -0.15*** | (0.04) | -0.11*** | (0.03) |
| **Gender** | | | | | | | | |
| Female | --- | --- | --- | --- | --- | --- | --- | --- |
| Male | -2.52*** | (0.25) | -0.84 | (1.36) | 0.70 | (1.14) | -0.71 | (1.02) |
| **Race/Ethnicity** | | | | | | | | |
| White | --- | --- | --- | --- | --- | --- | --- | --- |
| Black | -1.00*** | (0.15) | 0.28 | (0.95) | 1.15 | (0.95) | -0.51 | (1.50) |
| Hispanic | -0.49* | (0.20) | 0.26 | (0.92) | 0.98 | (0.94) | -0.29 | (1.37) |
| Other | -1.35*** | (0.25) | 0.64 | (1.54) | 1.22 | (1.46) | 0.42 | (1.58) |
| Unknown | -0.88*** | (0.16) | 2.18 | (1.12) | 1.86 | (1.12) | -2.11 | (1.51) |
| **Marital Status** | | | | | | | | |
| Married | --- | --- | --- | --- | --- | --- | --- | --- |
| Separated/Divorced/Widowed | 0.06 | (0.14) | 0.15 | (1.00) | 0.08 | (0.80) | 0.30 | (0.61) |
| Single/Never Married | -0.54*** | (0.15) | 0.80 | (1.22) | 0.96 | (1.15) | -0.50 | (0.93) |
| **VA Eligibility Category** | | | | | | | | |
| Service Connected | --- | --- | --- | --- | --- | --- | --- | --- |
| Below Means Test/Not Service Connected | 1.50*** | (0.19) | -1.31 | (1.71) | -0.22 | (1.18) | 3.45*** | (0.93) |
| Above Means Test/Copay | 1.03* | (0.47) | -1.58 | (2.62) | -3.15 | (2.65) | 0.10 | (1.12) |
| Other | 0.45* | (0.22) | 1.54 | (2.14) | 1.71 | (2.00) | 1.15 | (1.33) |
| **Service Connected Percent** | | | | | | | | |
| 0% | --- | --- | --- | --- | --- | --- | --- | --- |
| 1%-50% | 0.23 | (0.44) | 1.62 | (2.31) | 4.25* | (2.10) | 2.11 | (1.35) |
| 51%-100% | 0.60 | (0.44) | -1.46 | (2.79) | 1.08 | (2.39) | 1.60 | (1.11) |
| **Insurance** | | | | | | | | |
| Private Insurance | --- | --- | --- | --- | --- | --- | --- | --- |
| None | 0.13 | (0.20) | 0.38 | (1.29) | -0.68 | (1.27) | -0.44 | (0.85) |
| Medicare/Medicaid | 0.19 | (0.23) | -0.85 | (1.68) | -1.12 | (1.48) | -0.14 | (1.03) |
| **Homeless** | | | | | | | | |
| No | --- | --- | --- | --- | --- | --- | --- | --- |
| Yes | 1.41*** | (0.27) | 7.77*** | (2.35) | 7.52** | (2.40) | 4.41 | (2.07) |
| **Distance from home to clinic** | 0.00 | (0.00) | -0.01 | (0.04) | -0.03 | (0.03) | -0.01 | (0.03) |
| **Charlson comorbidity Index** | 0.62*** | (0.08) | -1.55** | (0.57) | -2.14*** | (0.50) | 1.60** | (0.49) |
| **Other Mental Health Diagnoses** | | | | | | | | |
| Serious Mental Illness | 1.81*** | (0.31) | 9.28*** | (1.71) | 14.77*** | (2.38) | 14.87*** | (2.15) |
| Substance Use Disorder | 4.04*** | (0.24) | 9.12*** | (1.40) | 8.38*** | (1.23) | 2.38** | (0.80) |
| Post-traumatic Stress Disorder | 10.05*** | (0.39) | 12.83*** | (1.15) | 17.66*** | (1.10) | 15.23*** | (0.94) |
| Anxiety | 6.83*** | (0.18) | 11.43*** | (1.29) | 12.07*** | (0.90) | 11.36*** | (0.89) |
| Number of observations | 201,804 | | | | 13,640 | | | |
| Number of patients | 81,181 | | | | 12,663 | | | |

***p<0.001, **p<0.01, *p<0.05; Models additionally included clinic indicators, but data is not shown.

ΔP (%) = Marginal Probability (in Percent); SE = Delta-method Standard Error; Multi-level logistic regression models controlled for year and clinic fixed effects, PACT implementation support (Evidence-Based Quality Improvement in Patient Aligned Care Team [EBQI-PACT] status), and patient characteristics (age, gender, race/ethnicity, marital status, VA eligibility, disability service connection, health insurance, homelessness, distance from home to primary care clinic, Charlson Comorbidity Index, co-morbid mental health diagnoses).

We observed some significant differences based on patient characteristics in depression diagnosis and quality of care in our study patients (Table 4.1). Several patient characteristics were associated with lower probability of diagnosis of a new depression episode: older age, male gender, black race, Hispanic ethnicity, single. Others were associated with higher probability of diagnosis of a new depression episode: homeless, multiple chronic comorbidities, and having any co-morbid mental health diagnoses. Older patients had lower probability of receiving minimally appropriate treatment if newly diagnosed with depression and follow-up within 84 days and 180 days of diagnosis, than younger patients. Patients who are homeless or have other co-morbid mental health diagnoses had higher probability of receiving minimally appropriate treatment if newly diagnosed with depression and follow-up within 84 days and 180 days of diagnosis. Patients with more chronic comorbidities had higher probability of receiving minimally appropriate treatment if newly diagnosed with depression but lower probability of follow-up within 84 days and 180 days of diagnosis, than patients with less comorbidities.

We noted no significant effect of clinic characteristics on depression quality of care in our study patients [data not shown]. An exception was distance (in miles) to nearest VAMC, which yielded mixed results for the four depression care quality metrics. We also did not observe any EBQI-PACT effect on depression quality of care in our study patients (Table 4.1).

Results from multivariable analyses did not differ when we separately examined patients with multiple chronic comorbidities, patients who were age 65 years or older, and patients with co-morbid mental health diagnoses, nor when we ran alternate regression models (i.e., probit and linear probability regressions) [data not shown].

## Discussion

We did not detect an effect of clinic PC-MHI engagement on depression diagnosis or quality of care, when we constructed three population-based depression care quality metrics in a large regional cohort of VA primary care patients. Even when isolating our analyses to vulnerable primary care patient populations (i.e., multiple chronic comorbidities, age 65 years or older, co-existing mental illnesses), we still did not observe an association between clinic PC-MHI engagement and diagnosis of patients with a new episode of depression, follow-up of these patients within 84 days or 180 days of diagnosis, or provision of minimally appropriate treatment for these patients. When previous studies characterized PC-MHI differently (i.e., comparing clinics with or without PC-MHI programs, comparing patients with or without a PC-MHI visit), there have been observed PC-MHI effects on patient mental health diagnosis[7,53] and MHS treatment initiation.[52,53,55] When we examined clinic engagement in PC-MHI programs through the intensity of service use, we have yet to detect a "dose-response" relationship for PC-MHI in primary care clinics. It is worth noting, however, that our analyses had large standard errors, suggesting that our model estimates may be imprecise and that additional exploration into model stability is needed. Other possible explanations for our null findings may be that there is no relationship between clinic PC-MHI engagement and depression care quality (e.g., PC-MHI program presence may matter, but not intensity of PC-MHI service use) or that the depression care quality metrics used in our study were not sensitive enough to detect a PC-MHI effect.

There were some notable disparities in depression quality of care in our study patients. Older patients appeared to fare worse than younger patients in all outcome measures, consistent with prior literature.[26,77] However, patients affected by homelessness or co-existing mental illness received better quality of depression care than their counterparts – higher probability

receiving minimally appropriate treatment if newly diagnosed to have depression and follow-up within 84 days and 180 days of diagnosis, although such patients tend to receive lower quality health care.[78-80] Our findings contribute to literature demonstrating that the VA is an important safety net provider and public mental healthcare system[10] and one that provides high quality outpatient mental health care.[81] Finally, contrary to studies of other healthcare systems, we observed no racial-ethnic differences in the provision of minimally appropriate treatment for patients with newly diagnosed depression nor in the follow-up within 84 days and 180 days of diagnosis.[82,83]

# Chapter 5. Conclusion

## Summary of Key Findings

There is increasing recognition of the importance of behavioral health care integration into the patient-centered medical homes and, thus, lessons to be learned from VA's national implementation of Primary Care – Mental Health Integration. As envisioned, PC-MHI and primary care providers aimed to provide the majority of mental health care for patients with low-to-moderate complexity mental illnesses. Despite numerous efficacy and effectiveness trials supporting collaborative care, the diffusion of these team-based primary care models into real world clinical practices has been slow, which attests to the uniqueness of VA's universal rollout of the PC-MHI initiative ten years ago. Dissemination and implementation of this primary care innovation in the VA and beyond is challenged by the dearth of meaningful and valid metrics to monitor practice-level variation. In this dissertation, we devise and validate a new metric for clinic engagement in PC-MHI services, calculated as the number of PC-MHI service users divided by the number of primary care patients in each clinic during each year.

Primary patients with co-existing mental and physical illnesses can be high utilizers of medical care, but may be successfully managed through integrated mental health services. In the second chapter, we observed that greater clinic PC-MHI engagement was associated with significantly more total mental health and less MHS visits, likely because patients receive more mental health care through PC-MHI instead of non-primary care based MHS services. Despite the reduction in use of MHS services, greater clinic PC-MHI engagement did not appear to have an adverse impact on ED visits, hospitalizations, total patient costs, or mortality. As a result, PC-MHI may improve mental healthcare value for primary care patients, as it appears to improve realized accessibility to mental healthcare without necessarily increasing costs.

In the third chapter, we found that increasing clinic PC-MHI engagement was associated with significant decreases in general MHS visits, as patients may alternatively receive mental health care through PC-MHI. PC-MHI programs appear to reduce reliance on MHS clinics and thus may be effective in engaging those reluctant to seek mental health care. PC-MHI services in the VA do appear to be focused on more "bread and butter" mental health conditions and are utilized more heavily by patients with depression than with psychosis. Implemented appropriately these programs can help ensure that primary care is providing evidence-based stepped care and that patients with more intensive mental health concerns (e.g., psychosis) are appropriately referred to specialty services.

Given that PC-MHI services may substitute for MHS services for primary care patients with mild-to-moderate complexity mental health conditions, chapter four findings have at least demonstrated no difference in depression care provided within primary care, as compared to specialty care. Additional sensitivity analyses to isolate various processes of care (i.e., antidepressant prescription, psychotherapy referral, mental health screening) may confirm our null findings or be more sensitive in identifying PC-MHI effects on quality of care for individuals with depression. Dissertation findings continued to identify gaps in depression care quality for aging Veterans with newly diagnosed depression, yet demonstrated the provision of higher quality VA mental health care for certain vulnerable patient populations (i.e., homeless, comorbid mental illness).

**Strengths and Limitations**

Dissertation findings contribute to the research literature in several ways. To our knowledge, it is the first longitudinal study to examine the full-range of healthcare utilization and

medical spending related to PC-MHI in the VA, particularly in a region where the uptake of these services is relatively robust. It is also the first to longitudinally examine the relationship between clinic PC-MHI engagement and three validated population-based depression quality metrics in a large primary care population. Thus, it is an important addition to literature on large-scale dissemination and implementation of collaborative care, which remains far from usual practice despite strong evidence of effectiveness.[38,44] Furthermore, our measure of clinic PC-MHI engagement characterizes the difference among clinics by intensity of PC-MHI program uptake, in contrast to previous studies that characterize the presence or absence of a PC-MHI program.[64] Thus, in providing additional data beyond that of a dichotomous variable, it may contribute to the development of meaningful and valid quality measures for clinic PC-MHI engagement to assist with the dissemination and implementation of integrated care.[75] Since the Centers for Medicare & Medicaid Services now provide financial support for integrated care (i.e., same day billing for mental health and primary care services), it may become more commonplace for all health systems to use existing administrative data to determine clinic engagement in such care models.[84]

There are several limitations to our research study. First, our cohort study capitalized on the longitudinal variation in clinic PC-MHI engagement to understand panel utilization/costs trends but is limited by not accounting for patient dropouts or clinic switches. The study population does not include additional primary care enrollees of these clinics who were not part of the longitudinal cohort. Second, in using an administrative data source, we may be limited by coding inaccuracies (i.e., inconsistent coding of mental health telephone visits). Third, our analyses there were unmeasured factors in our analyses. For example, we did not have information on non-face-to-face modalities of depression follow-up (e.g., telephone visits) or

mental healthcare staffing patterns,[85] which likely impact depression care quality. Fourth, we do not investigate patient-reported measures of clinical quality of care (e.g., patient satisfaction), chronic disease health outcomes (e.g., diabetes complications), patient social functioning (e.g., employment status), and other important quality metrics. Finally, findings may not generalize beyond the study cohort of primary care patients within Southern California's VA healthcare systems during the five-year period.

**Future Research and Policy Implications**

This dissertation works toward understanding the true healthcare value behavioral health integration into patient-centered medical homes in a large healthcare delivery system, though several gaps in knowledge remain. We need to perform additional validation on primary care clinic engagement in PC-MHI as a quality measure and to understand the effect of PC-MHI on quality of care for patients with depression and other targeted mental health conditions. For example, it remains unclear whether greater clinic PC-MHI engagement may be associated with increased patient refills of antidepressants or completion of psychotherapy sessions with more sensitive cut-points (i.e., 2 months of medication refills over 12 months, as opposed to over 6 months). Furthermore, it may be worthwhile to examine PC-MHI effects on use of mental health screening, such as the Patient Health Questionnaire for depression.

It is unknown whether PC-MHI, as practically implemented in all VA primary care clinics across the country, exerts any downstream effects on individuals. Future research should move beyond the analyses of process measures to outcome measures of healthcare quality to examine depression symptomatology, daily functioning, and other patient-reported outcomes measures. Additional study into the effect of these team-based care delivery models on physical

health outcomes related to chronic disease management, such as glycemic and blood pressure control in patients with diabetes, would offer insight on how to optimize care management for individuals with comorbid mental and physical health conditions. This information would allow the VA to offer better tailored primary care and mental health services for different patient subgroups.

In this dissertation, we capitalized on the observed variation in clinic PC-MHI engagement to study its effect on healthcare delivery outcomes; yet, we cannot truly grasp the extent of this variation from electronic administrative patient data sources alone. It may be worthwhile to explore why some primary care clinics have such low uptake of PC-MHI services, while others fully embrace such innovations. Recent clinic PC-MHI engagement rates remain in the single-digit percentile range, despite common knowledge that more than a quarter of VA patients have diagnosed mental health needs. Mixed methods research, such as incorporating qualitative data, may allow us to understand facilitators and barriers to adoption and implementation of these team-based care models and various viewpoints on how to reach optimal collaboration between mental health and primary care providers. Qualitative information garnered may allow us to improve upon quality measures to assist with the dissemination and implementation of evidence-based behavioral health integration practices.

In conclusion, our five-year study of a regional VA primary care patient cohort demonstrated that increasing PC-MHI service use appeared to substitute for non-primary care based MHS visits – effectively shifting mental health care for common mental illnesses like depression from specialty to primary care settings, without adverse effects on quality of care, acute care use, patient mortality, or total cost of VA care. Future research should continue to examine mental health access and quality metrics affected by PC-MHI and move to incorporate

unmeasured factors in this dissertation, such as mental health staffing patterns, since potential policy implications include shifting MHS personnel and increasing resources for PC-MHI services within VA patient-centered medical homes. Furthermore, these analyses need to be replicated beyond one Veterans Integrated Service Network and perhaps even generalized to non-VA healthcare settings with similar efforts in behavioral health integration into patient-centered medical homes.

## Appendices

Table A.2.1: Calculated Clinic PC-MHI Engagement Rate in each Study Year

| Clinic | FY09 | FY10 | FY11 | FY12 | FY13 |
|---|---|---|---|---|---|
| 1 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 3 | 0.0% | 0.0% | 0.0% | 1.7% | 5.1% |
| 4 | 0.0% | 0.0% | 0.7% | 2.9% | 8.2% |
| 5 | 0.0% | 0.1% | 1.5% | 1.6% | 1.5% |
| 6 | 0.0% | 0.6% | 11.0% | 12.3% | 10.4% |
| 7* | 0.0% | 2.1% | 3.4% | 3.7% | 9.3% |
| 8 | 0.0% | 8.8% | 11.9% | 17.6% | 10.4% |
| 9 | 0.2% | 0.1% | 0.1% | 0.0% | 0.0% |
| 10 | 0.2% | 0.4% | 0.0% | 0.0% | 0.0% |
| 11 | 0.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| 12 | 0.3% | 2.2% | 4.0% | 4.3% | 5.6% |
| 13 | 0.5% | 5.0% | 8.2% | 25.7% | 15.0% |
| 14 | 0.7% | 0.0% | 26.1% | 31.5% | 33.7% |
| 15 | 1.1% | 10.5% | 14.5% | 16.6% | 21.4% |
| 16* | 1.2% | 3.6% | 7.0% | 9.0% | 8.3% |
| 17 | 1.3% | 1.1% | 1.5% | 1.6% | 0.5% |
| 18 | 1.5% | 2.1% | 2.7% | 4.0% | 6.5% |
| 19 | 2.0% | 2.0% | 1.5% | 0.7% | 0.3% |
| 20 | 2.1% | 7.4% | 4.5% | 5.8% | 4.3% |
| 21 | 2.5% | 6.8% | 9.0% | 18.4% | 22.7% |
| 22 | 4.2% | 16.3% | 22.8% | 18.5% | 18.8% |
| 23* | 4.5% | 5.8% | 7.0% | 6.5% | 15.6% |
| 24* | 5.0% | 4.5% | 4.6% | 6.3% | 11.4% |
| 25 | 5.9% | 27.9% | 30.5% | 21.6% | 20.4% |
| 26 | 6.7% | 23.3% | 23.3% | 33.1% | 36.1% |
| 27 | 13.7% | 5.3% | 0.5% | 10.1% | 14.6% |
| 28 | 14.0% | 30.7% | 34.9% | 40.7% | 34.7% |
| 29 | 15.9% | 26.0% | 25.4% | 32.4% | 36.7% |
| **First Quartile** | 0.0% | 0.2% | 0.7% | 1.6% | 1.5% |
| **Median** | 1.1% | 2.2% | 4.5% | 6.3% | 9.3% |
| **Third Quartile** | 4.2% | 7.4% | 11.9% | 18.4% | 18.8% |

*Denotes VA Healthcare System-based clinics

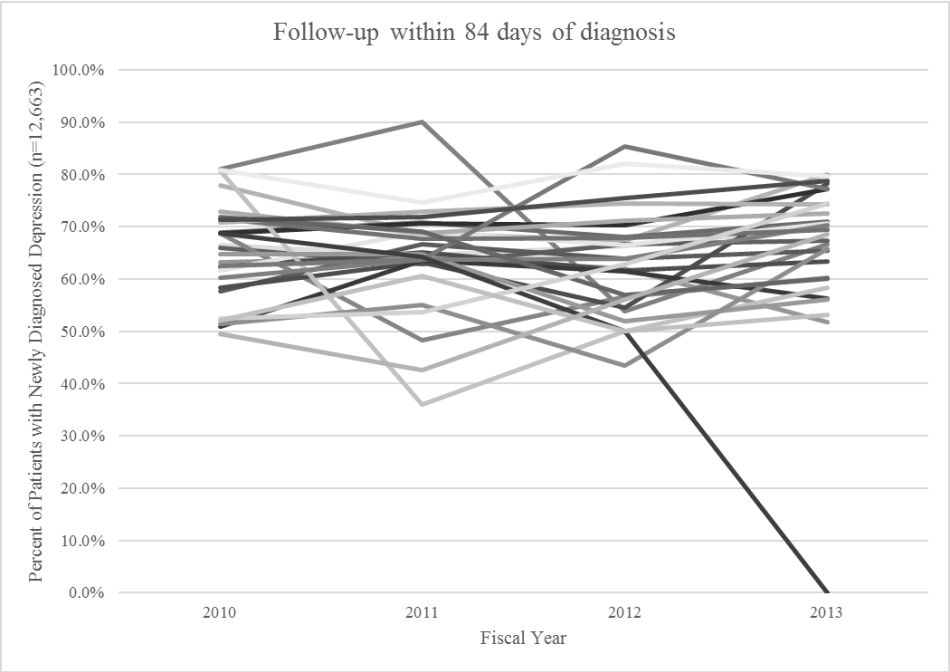
Table A.2.2: VA Electronic Encounter Codes Identifying Mental Health Specialty (MHS) Visits

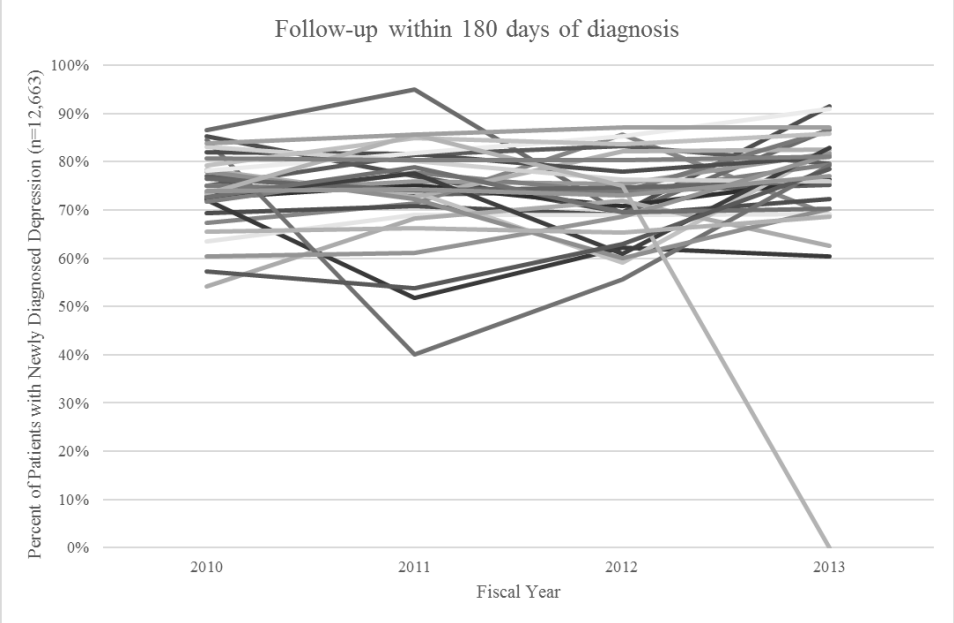
| Encounter Code | Description |
|---|---|
| 156 | Home Based Primary Care (HBPC)-psychologist |
| 157 | HBPC-psychiatrist |
| 163 | Chaplain clinical services-individual |
| 164 | Chaplain clinical services-group |
| 165 | Bereavement counsel |
| 166 | Chaplain service-individual |
| 167 | Chaplain service-group |
| 168 | Chaplain service-collateral |
| 501 | Homeless Mentally Ill (HMI) outreach |
| 502† | Mental health-individual |
| 504† | Grant & per diem group |
| 505 | Day treatment-individual |
| 506 | Day hospital-individual |
| 507 | Housing and Urban Development-VA Supportive Housing (HUD-VASH) group |
| 508 | Healthcare for Homeless Veterans/Homeless Chronically Mentally Ill (HCHV/HCMI) group |
| 509† | Psychiatry |
| 510† | Psychology |
| 511† | Grant & per diem-individual |
| 512† | Psychiatry consultation |
| 513 | Substance use disorder-individual |
| 514 | Substance use disorder-home visit |
| 515 | Compensated Work Therapy/Transitional Work Experience (CWT/TWE)-HCMI |
| 516 | Post-traumatic stress disorder (PTSD)-group |
| 517 | CWT/substance abuse |
| 518 | CWT/transitional residence substance abuse |
| 519 | Substance abuse disease/PTSD teams |
| 520 | Long term enhancement-individual |
| 521 | Long term enhancement-group |
| 522 | HUD/VASH-individual |
| 523 | Opioid substitution |
| 524 | Active duty sex trauma |
| 525 | Women's stress disorder |
| 529 | HCHV/HCMI-individual |
| 532 | Psychosocial rehabilitation-individual |
| 533 | Mental health intervention biomed care-individual |
| 534* | Mental health integrated care-individual |
| 535 | Mental health vocational assistance-individual |
| 538† | Psychological testing |
| 539* | Mental health integrated care-group |
| 540 | PTSD clinical team-individual |
| 541 | PTSD clinic |
| 545 | Telephone/Substance use disorder |
| 547 | Intensive substance use disorder-group |
| 548 | Intensive substance use disorder-individual |
| 550† | Mental health clinic-group |
| 551 | Intensive Psychiatric Community Care (IPCC) community clinic/day program visit |
| 552 | Mental Health Intensive Case Management (MHICM)-individual |
| 553 | Day treatment-group |
| 554 | Day hospital-group |
| 555 | Drug dependence-group |
| 556 | Alcohol treatment-group |
| 557† | Psychiatry-group |
| 558† | Psychology-group |
| 559 | Psychosocial rehabilitation-group |
| 560 | Substance use disorder-group |
| 561 | PTSD clinical team-group |
| 562 | PTSD-individual |
| 564† | Mental health team case management |
| 565 | Mental health intervention biomed-group |
| 566 | Mental health risk-factor reduction educational-group |
| 567 | MHICM-group |
| 568 | Mental health Compensated Work Therapy/Supported Employment (CWT/SE) face-to-face |
| 569 | Mental health CWT/SE non face-to-face CBO non-count |
| 570 | Mental health CWT/TWE non face-to-face CBO non-count |
| 571 | Services for Returning Veterans-Mental Health (SeRV-MH)-individual |
| 572 | SeRV-MH-group |
| 573 | Mental health incentive therapy face-to-face |
| 574 | Mental health CWT/TWE face to face |
| 575 | Mental health vocational assistance-group |
| 576 | Psycho-geriatric clinic-individual |
| 577 | Psycho-geriatric clinic-group |
| 578 | Psycho-geriatric clinic-day program |
| 579 | Telephone/ Psycho-geriatrics |
| 580 | PTSD day hospital |
| 581 | PTSD day treatment |
| 582 | Psychosocial Rehabilitation Recovery Center (PRRC)-individual |
| 583 | PRRC-group |
| 584 | Telephone/ PRRC |
| 589 | Non-active duty sex trauma |
| 590 | Community Outreach to Homeless Veterans by Staff Other than HCHV and RRTP Programs |
| 591 | Incarcerated Veterans reentry |
| 593 | Residential Rehabilitation Treatment Program (RRTP) Outreach Services |
| 594 | RRTP aftercare community |
| 595 | RRTP aftercare group |
| 596 | RRTP admission screening services |
| 597 | Telephone/RRTP |
| 598 | RRTP outpatient-individual |
| 599 | RRTP outpatient-group |

*Indicates outpatient visits for mental health integrated care by a mental health provider in Primary Care-Mental Health Integrated (PC-MHI) programs.

†Indicates general mental health specialty (MHS) visits.

Figure A.4.1: Quality of Care Over Time for Patients with Newly Diagnosed with Depression by Clinic



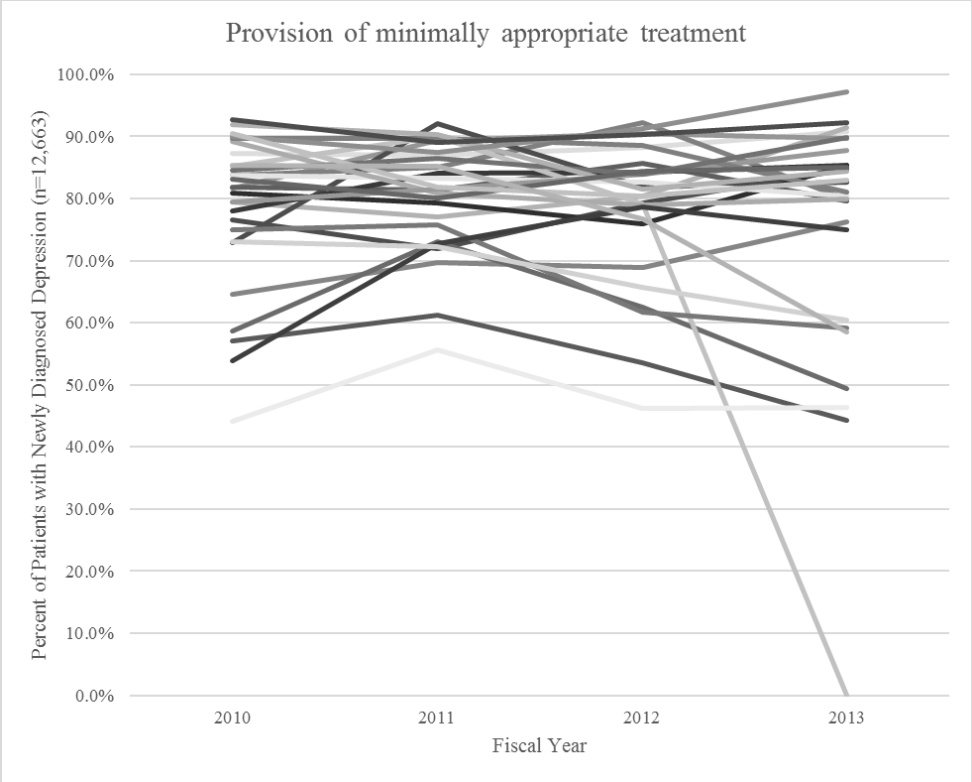

Provision of minimally appropriate treatment
Percent of Patients with Newly Diagnosed Depression (n=12,663)
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
2010
2011
2012
2013
Fiscal Year

Table A.4.1: Effect of Clinic PC-MHI Engagement on Depression Care Quality of Care (Displayed in Odds Ratios)

| | Diagnosis of a new depression episdoe | | Follow-up within 84 days of diagnosis | | Follow-up within 180 days of diagnosis | | Provision of minimally appropriate treatment | |
|---|---|---|---|---|---|---|---|---|
| | **OR** | **95% CI** | **OR** | **95% CI** | **OR** | **95% CI** | **OR** | **95% CI** |
| **Clinic PC-MHI Engagement** | 1.01 | [0.45,2.27] | 0.26 | [0.03,2.10] | 0.35 | [0.04,3.03] | 8.76 | [0.03,2241.6 |
| **EBQI-PACT** | 1.02 | [0.85,1.23] | 0.94 | [0.77,1.15] | 0.93 | [0.79,1.10] | 1.07 | [0.71,1.60] |
| **Fiscal Year** | | | | | | | | |
| 2010 | --- | --- | --- | --- | --- | --- | --- | --- |
| 2011 | 0.88*** | [0.83,0.93] | 1.05 | [0.91,1.22] | 1.02 | [0.86,1.21] | 0.87 | [0.68,1.10] |
| 2012 | 0.83*** | [0.76,0.90] | 1.01 | [0.83,1.24] | 0.93 | [0.77,1.12] | 0.81* | [0.66,0.99] |
| 2013 | 0.72*** | [0.65,0.81] | 1.2 | [0.93,1.54] | 1.18 | [0.91,1.54] | 0.78 | [0.50,1.21] |
| **Age** | 0.98*** | [0.97,0.98] | 0.99* | [0.99,1.00] | 0.99*** | [0.98,0.99] | 0.99*** | [0.98,0.99] |
| **Gender** | | | | | | | | |
| Female | --- | --- | --- | --- | --- | --- | --- | --- |
| Male | 0.58*** | [0.52,0.64] | 0.95 | [0.81,1.11] | 1.05 | [0.89,1.24] | 0.93 | [0.75,1.15] |
| **Race/Ethnicity** | | | | | | | | |
| White | --- | --- | --- | --- | --- | --- | --- | --- |
| Black | 0.8*** | [0.75,0.86] | 1.02 | [0.91,1.14] | 1.09 | [0.95,1.25] | 0.95 | [0.69,1.29] |
| Hispanic | 0.9* | [0.82,0.98] | 1.02 | [0.91,1.13] | 1.08 | [0.94,1.23] | 0.97 | [0.73,1.29] |
| Other | 0.74*** | [0.66,0.83] | 1.04 | [0.87,1.24] | 1.09 | [0.88,1.35] | 1.05 | [0.75,1.45] |
| Unknown | 0.82*** | [0.76,0.88] | 1.14 | [1.00,1.29] | 1.15 | [0.98,1.35] | 0.8 | [0.58,1.11] |
| **Marital Status** | | | | | | | | |
| Married | --- | --- | --- | --- | --- | --- | --- | --- |
| Separated/Divorced/Widowed | 1.01 | [0.95,1.08] | 1.01 | [0.90,1.13] | 1.01 | [0.90,1.13] | 1.03 | [0.91,1.17] |
| Single/Never Married | 0.88*** | [0.83,0.94] | 1.05 | [0.91,1.21] | 1.07 | [0.91,1.27] | 0.95 | [0.78,1.15] |
| **VA Eligibility Category** | | | | | | | | |
| Service Connected | --- | --- | --- | --- | --- | --- | --- | --- |
| Below Means Test/Not Service Connected | 1.42*** | [1.30,1.55] | 0.93 | [0.76,1.13] | 0.98 | [0.83,1.17] | 1.44*** | [1.17,1.76] |
| Above Means Test/Copay | 1.27* | [1.04,1.55] | 0.91 | [0.67,1.23] | 0.79 | [0.54,1.17] | 1.01 | [0.80,1.27] |
| Other | 1.12* | [1.01,1.24] | 1.1 | [0.86,1.40] | 1.13 | [0.85,1.51] | 1.13 | [0.85,1.49] |
| **Service Connected Percent** | | | | | | | | |
| 0% | --- | --- | --- | --- | --- | --- | --- | --- |
| 1%-50% | 1.05 | [0.87,1.27] | 1.1 | [0.84,1.44] | 1.37* | [1.01,1.85] | 1.25 | [0.95,1.63] |
| 51%-100% | 1.15 | [0.94,1.39] | 0.92 | [0.66,1.27] | 1.08 | [0.77,1.53] | 1.18 | [0.94,1.49] |
| **Insurance** | | | | | | | | |
| Private Insurance | --- | --- | --- | --- | --- | --- | --- | --- |
| None | 1.03 | [0.94,1.12] | 1.02 | [0.88,1.19] | 0.95 | [0.79,1.14] | 0.96 | [0.80,1.14] |
| Medicare/Medicaid | 1.03 | [0.93,1.15] | 0.95 | [0.78,1.16] | 0.92 | [0.74,1.14] | 0.99 | [0.80,1.22] |
| **Homeless** | | | | | | | | |
| No | --- | --- | --- | --- | --- | --- | --- | --- |
| Yes | 1.36*** | [1.20,1.53] | 1.58*** | [1.22,2.06] | 1.74** | [1.22,2.49] | 1.59 | [0.99,2.56] |
| **Distance from home to clinic** | 1 | [1.00,1.00] | 1 | [1.00,1.00] | 1 | [0.99,1.00] | 1 | [0.99,1.01] |
| **Charlson comorbidity Index** | 1.15*** | [1.11,1.19] | 0.91** | [0.85,0.98] | 0.85*** | [0.79,0.92] | 1.18** | [1.06,1.32] |
| **Other Mental Health Diagnoses** | | | | | | | | |
| Serious Mental Illness | 1.46*** | [1.27,1.68] | 1.73*** | [1.40,2.14] | 2.97*** | [2.08,4.25] | 4.76*** | [2.77,8.16] |
| Substance Use Disorder | 2.4*** | [2.15,2.69] | 1.71*** | [1.44,2.03] | 1.85*** | [1.55,2.22] | 1.28** | [1.07,1.54] |
| Post-traumatic Stress Disorder | 8.72*** | [7.03,10.83] | 2.13*** | [1.84,2.47] | 3.68*** | [3.04,4.44] | 4.94*** | [3.32,7.34] |
| Anxiety | 4.48*** | [4.05,4.96] | 1.96*** | [1.67,2.30] | 2.44*** | [2.10,2.82] | 3.29*** | [2.39,4.53] |

OR=Odds Ratio; CI=Confidence Interval; Multi-level logistic regression models controlled for year and clinic fixed effects, PACT implementation support (Evidence-Based Quality Improvement in Patient Aligned Care Team [EBQI-PACT] status), and patient characteristics (age, gender, race/ethnicity, marital status, VA eligibility, disability service connection, health insurance, homelessness, distance from home to primary care clinic, Charlson Comorbidity Index, co-morbid mental health diagnoses).

**References/Bibliography**


1. New Freedom Commission on Mental Health. *Achieving the Promise: Transforming Mental Health Care in America. Final Report.* Rockville, MD2003. DHHS Pub. No. SMA-03-3832.
2. Spitzer RL, Kroenke K, Williams JB, Group PHQPCS. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. *JAMA : the journal of the American Medical Association.* 1999;282(18):1737-1744.
3. Katon WJ. The Institute of Medicine "Chasm" report: implications for depression collaborative care models. *General hospital psychiatry.* 2003;25(4):222-229.
4. Wang PS, Berglund P, Kessler RC. Recent care of common mental disorders in the United States. *Journal of general internal medicine.* 2000;15(5):284-292.
5. Armesto SG, Medeiros H, Wei L. Information availability for measuring and comparing quality of mental health care across OECD countries. 2008.
6. Druss BG, Zhao L, Von Esenwein S, Morrato EH, Marcus SC. Understanding excess mortality in persons with mental illness: 17-year follow up of a nationally representative US survey. *Medical care.* 2011;49(6):599-604.
7. Zivin K, Pfeiffer PN, Szymanski BR, et al. Initiation of Primary Care-Mental Health Integration programs in the VA Health System: associations with psychiatric diagnoses in primary care. *Medical care.* 2010;48(9):843-851.

8. Agha Z, Lofgren RP, VanRuiswyk JV, Layde PM. Are patients at Veterans Affairs medical centers sicker? A comparative analysis of health status and medical resource use. *Arch Intern Med.* 2000;160(21):3252-3257.

9. Watkins KE, Pincus HA, Paddock S, et al. Care for veterans with mental and substance use disorders: good performance, but room to improve on many measures. *Health affairs*. 2011:10.1377/hlthaff. 2011.0509.

10. Redlick RW WM, Atay JE, et al. *Highlights of organized mental health services in 1992 and major national and state trends, in Mental Health, United States, 1996.* Washington, DC: DHHS;1996.

11. Goldberg RW, Resnick SG. US Department of Veterans Affairs (VA) efforts to promote psychosocial rehabilitation and recovery. 2010.

12. Liu CF, Chapko M, Bryson CL, et al. Use of outpatient care in Veterans Health Administration and Medicare among veterans receiving primary care in community-based and hospital outpatient clinics. *Health services research.* 2010;45(5 Pt 1):1268-1286.

13. Watkins KE, Smith B, Akincigil A, et al. The Quality of Medication Treatment for Mental Disorders in the Department of Veterans Affairs and in Private-Sector Plans. *Psychiatric services.* 2015;67(4):391-396.

14. Regier DA, Goldberg ID, Taube CA. The de facto US mental health services system: a public health perspective. *Archives of general psychiatry.* 1978;35(6):685-693.

15. US Deparment of Veterans Affairs. Strategic Analytics for Improvement and Learning (SAIL): Los Angeles Scorecard for FY2017Q2. 2017; https://www.va.gov/QUALITYOFCARE/measure-up/Strategic_Analytics_for_Improvement_and_Learning_SAIL.asp. Accessed August 24, 2017.

16. Grembowski DE, Martin D, Patrick DL, et al. Managed care, access to mental health specialists, and outcomes among primary care patients with depressive symptoms. *Journal of general internal medicine.* 2002;17(4):258-269.

17. Simon GE, Ding V, Hubbard R, et al. Early dropout from psychotherapy for depression with group- and network-model therapists. *Adm Policy Ment Health.* 2012;39(6):440-447.

18. Farmer MM, Rubenstein LV, Sherbourne CD, et al. Depression quality of care: measuring quality over time using VA electronic medical record data. *Journal of general internal medicine.* 2016;31(1):36-45.

19. Cunningham PJ. Beyond parity: primary care physicians' perspectives on access to mental health care. *Health affairs.* 2009;28(3):w490-501.

20. Katon W, Unutzer J, Wells K, Jones L. Collaborative depression care: history, evolution and ways to enhance dissemination and sustainability. *General hospital psychiatry.* 2010;32(5):456-464.

21. Mechanic D. More people than ever before are receiving behavioral health care in the United States, but gaps and challenges remain. *Health affairs.* 2014;33(8):1416-1424.

22. Peek CJ , National Integration Academy Council. *Lexicon for Behavioral Health and Primary Care Integration: Concepts and Definitions Developed by Expert Consensus.* Rockville, MD: Agency for Healthcare Research and Quality;2013. AHRQ Publication No.13-IP001-EF.

23. Butler M, Kane RL, McAlpine D, et al. Integration of mental health/substance abuse and primary care. 2008.

24. Uebelacker LA, Smith M, Lewis AW, Sasaki R, Miller IW. Treatment of depression in a low-income primary care setting with colocated mental health care. *Families, systems & health : the journal of collaborative family healthcare.* 2009;27(2):161-171.

25. Archer J, Bower P, Gilbody S, et al. Collaborative care for depression and anxiety problems. *The Cochrane database of systematic reviews.* 2012;10:CD006525.

26. Unutzer J, Katon W, Callahan CM, et al. Collaborative care management of late-life depression in the primary care setting: a randomized controlled trial. *JAMA : the journal of the American Medical Association.* 2002;288(22):2836-2845.

27. US Department of Health Human Services. Mental health: A report of the Surgeon General. 1999.

28. Administration SAaMHS. National Registry of Evidence-based Programs and Practices 2012; http://legacy.nreppadmin.net/ViewIntervention.aspx?id=301. Accessed December 4, 2016.

29. Gilbody S, Bower P, Fletcher J, Richards D, Sutton AJ. Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Archives of internal medicine.* 2006;166(21):2314-2321.

30. Glied S, Herzog K, Frank R. Review: the net benefits of depression management in primary care. *Medical Care Research and Review.* 2010;67(3):251-274.

31. Unützer J, Katon WJ, Fan M-Y, et al. Long-term cost effects of collaborative care for late-life depression. *The American journal of managed care.* 2008;14(2):95.

32. Advancing Integrated Mental Health Solutions. Collaborative Care. 2016; https://aims.uw.edu/collaborative-care. Accessed December 22, 2016.

33. Wagner EH, Austin BT, Von Korff M. Organizing care for patients with chronic illness. *Milbank Q.* 1996;74(4):511-544.

34. Katon WJ, Russo JE, Von Korff M, Lin EH, Ludman E, Ciechanowski PS. Long-term effects on medical costs of improving depression outcomes in patients with depression and diabetes. *Diabetes care.* 2008;31(6):1155-1159.

35. Katon WJ, Lin EH, Von Korff M, et al. Collaborative care for patients with depression and chronic illnesses. *The New England journal of medicine.* 2010;363(27):2611-2620.

36. Bogner HR, Morales KH, de Vries HF, Cappola AR. Integrated management of type 2 diabetes mellitus and depression treatment to improve medication adherence: a randomized controlled trial. *Ann Fam Med.* 2012;10(1):15-22.

37. Katon W, Unutzer J. Collaborative care models for depression: time to move from evidence to practice. *Arch Intern Med.* 2006;166(21):2304-2306.

38. Katzelnick DJ, Williams MD. Large-Scale Dissemination of Collaborative Care and Implications for Psychiatry. *Psychiatric services.* 2015;66(9):904-906.

39. Kolko DJ, Campo J, Kilbourne AM, Hart J, Sakolsky D, Wisniewski S. Collaborative care outcomes for pediatric behavioral health problems: a cluster randomized trial. *Pediatrics.* 2014;133(4):e981-992.

40. Chung B, Ong M, Ettner SL, et al. 12-month outcomes of community engagement versus technical assistance to implement depression collaborative care: a partnered, cluster, randomized, comparative effectiveness trial. *Ann Intern Med.* 2014;161(10 Suppl):S23-34.

41. Grypma L, Haverkamp R, Little S, Unutzer J. Taking an evidence-based model of depression care from research to practice: making lemonade out of depression. *General hospital psychiatry.* 2006;28(2):101-107.

42. Reiss-Brennan B, Briot PC, Savitz LA, Cannon W, Staheli R. Cost and quality impact of Intermountain's mental health integration program. *J Healthc Manag.* 2010;55(2):97-113; discussion 113-114.

43. Reiss-Brennan B, Brunisholz KD, Dredge C, et al. Association of Integrated Team-Based Care With Health Care Quality, Utilization, and Cost. *JAMA : the journal of the American Medical Association.* 2016;316(8):826-834.

44. A new direction in depression treatment in Minnesota: DIAMOND program, Institute for Clinical Systems Improvement, Bloomington, Minnesota. *Psychiatric services.* 2010;61(10):1042-1044.

45. Chang ET, Rose DE, Yano EM, et al. Determinants of readiness for primary care-mental health integration (PC-MHI) in the VA Health Care System. *Journal of general internal medicine.* 2013;28(3):353-362.

46. Post EP, Metzger M, Dumas P, Lehmann L. Integrating mental health into primary care within the Veterans Health Administration. *Families, systems & health : the journal of collaborative family healthcare.* 2010;28(2):83-90.

47. Department of Veterans Affairs. Uniform Mental Health Services In VA Medical Centers and Clinics. In: Veterans Health Administration, ed. Washington, DC,2015:34-36.

48. Pomerantz AS, Sayers SL. Primary care-mental health integration in healthcare in the Department of Veterans Affairs. *Families, systems & health : the journal of collaborative family healthcare.* 2010;28(2):78-82.

49. Chang ET, Simon A. *Report on Integrating Mental Health Into PACT (IMHIP) in the VA.* VA Office of Patient Care Services;2013.

50. Wray LO, Szymanski BR, Kearney LK, McCarthy JF. Implementation of primary care-mental health integration services in the Veterans Health Administration: program activity and associations with engagement in specialty mental health services. *J Clin Psychol Med Settings.* 2012;19(1):105-116.

51. Johnson-Lawrence V, Zivin K, Szymanski BR, Pfeiffer PN, McCarthy JF. VA primary care-mental health integration: patient characteristics and receipt of mental health services, 2008-2010. *Psychiatric services.* 2012;63(11):1137-1141.

52. Davis MJ, Moore KM, Meyers K, Mathews J, Zerth EO. Engagement in mental health treatment following primary care mental health integration contact. *Psychol Serv.* 2016;13(4):333-340.

53. Bohnert KM, Sripada RK, Mach J, McCarthy JF. Same-Day Integrated Mental Health Care and PTSD Diagnosis and Treatment Among VHA Primary Care Patients With Positive PTSD Screens. *Psychiatric services.* 2016;67(1):94-100.

54. Trivedi RB, Post EP, Sun H, et al. Prevalence, Comorbidity, and Prognosis of Mental Health Among US Veterans. *American journal of public health.* 2015;105(12):2564-2569.

55. Szymanski BR, Bohnert KM, Zivin K, McCarthy JF. Integrated care: treatment initiation following positive depression screens. *J Gen Intern Med.* 2013;28(3):346-352.

56. Institute of Medicine Committee on Quality of Health Care in America. *Crossing the quality chasm: a new health system for the 21st century.* National Academy Press; 2001.

57. Porter ME. Value-based health care delivery. *Ann Surg.* 2008;248(4):503-509.

58. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav.* 1995;36(1):1-10.

59. Donabedian A. The quality of care. How can it be assessed? *JAMA : the journal of the American Medical Association.* 1988;260(12):1743-1748.

60. New Freedom Commission on Mental Health. *Achieving the promise: Transforming mental health care in America. Final report.* . Rockville, MD: U.S. Department of Health and Human Services;2003.

61. Rosland AM, Nelson K, Sun H, et al. The patient-centered medical home in the Veterans Health Administration. *The American journal of managed care.* 2013;19(7):e263-272.

62. Hebert PL, Liu CF, Wong ES, et al. Patient-centered medical home initiative produced modest economic results for Veterans Health Administration, 2010-12. *Health affairs.* 2014;33(6):980-987.

63. Yoon J, Chow A, Rubenstein LV. Impact of Medical Home Implementation Through Evidence-based Quality Improvement on Utilization and Costs. *Medical care.* 2016;54(2):118-125.

64. Pfeiffer PN, Szymanski BR, Zivin K, Post EP, Valenstein M, McCarthy JF. Are primary care mental health services associated with differences in specialty mental health clinic use? *Psychiatric services.* 2011;62(4):422-425.

65. Rubenstein LV, Stockdale SE, Sapir N, et al. A patient-centered primary care practice approach using evidence-based quality improvement: rationale, methods, and early assessment of implementation. *Journal of general internal medicine.* 2014;29 Suppl 2:S589-597.

66. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. *Journal of Chronic Diseases.* 1987;40(5):373-383.

67. Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Medical care.* 2005;43(11):1130-1139.

68. Croghan TW, Brown JD. *Integrating Mental Health Treatment Into the Patient Centered Medical Home.* Rockville, MD: Agency for Healthcare Research and Quality; June 2010.

69. Working Party Group on Integrated Behavioral H, Baird M, Blount A, et al. Joint principles: integrating behavioral health care into the patient-centered medical home. *Ann Fam Med.* 2014;12(2):183-185.

70. Waxmonsky J, Verchinina L, Kim HM, et al. Correlates of Emergency Department Use by Individuals With Bipolar Disorder Enrolled in a Collaborative Care Implementation Study. *Psychiatric services.* 2016:appips201500347.

71. Coventry PA, Hudson JL, Kontopantelis E, et al. Characteristics of effective collaborative care for treatment of depression: a systematic review and meta-regression of 74 randomised controlled trials. *PloS one.* 2014;9(9):e108114.

72. Fitzmaurice G, Laird N, Ware J. Applied longitudinal analysis. 2004. *Hoboken Wiley-Interscience.*

73. Ornstein SM, Nietert PJ, Jenkins RG, Litvin CB. The prevalence of chronic diseases and multimorbidity in primary care practice: a PPRNet report. *J Am Board Fam Med.* 2013;26(5):518-524.

74. Yano EM, Chaney EF, Campbell DG, et al. Yield of practice-based depression screening in VA primary care settings. *Journal of general internal medicine.* 2012;27(3):331-338.

75. Goldman ML, Spaeth-Rublee B, Pincus HA. Quality Indicators for Physical and Behavioral Health Care Integration. *JAMA : the journal of the American Medical Association.* 2015;314(8):769-770.

76. Lam CA, Sherbourne C, Gelberg L, et al. Differences in Depression Care for Men and Women among Veterans with and without Psychiatric Comorbidities. *Womens Health Issues.* 2017;27(2):206-213.

77. Unutzer J, Simon G, Belin TR, Datt M, Katon W, Patrick D. Care for depression in HMO patients aged 65 and older. *J Am Geriatr Soc.* 2000;48(8):871-878.

78. Lam CA, Sherbourne C, Tang L, et al. The Impact of Community Engagement on Health, Social, and Utilization Outcomes in Depressed, Impoverished Populations: Secondary Findings from a Randomized Trial. *J Am Board Fam Med.* 2016;29(3):325-338.

79. Miranda J, Ong MK, Jones L, et al. Community-partnered evaluation of depression services for clients of community-based agencies in under-resourced communities in Los Angeles. *J Gen Intern Med.* 2013;28(10):1279-1287.

80. Liu J, Brown J, Morton S, et al. Disparities in diabetes and hypertension care for individuals with serious mental illness. *Am J Manag Care.* 2017;23(5):304-308.

81. Watkins KE, Pincus HA, Paddock S, et al. Care for veterans with mental and substance use disorders: good performance, but room to improve on many measures. *Health affairs.* 2011;30(11):2194-2203.

82. Alegria M, Chatterji P, Wells K, et al. Disparity in depression treatment among racial and ethnic minority populations in the United States. *Psychiatr Serv.* 2008;59(11):1264-1272.

83. Miranda J, Duan N, Sherbourne C, et al. Improving care for minorities: can quality improvement interventions improve care and outcomes for depressed minorities? Results of a randomized, controlled trial. *Health services research.* 2003;38(2):613-630.

84. Press MJ, Howe R, Schoenbaum M, et al. Medicare payment for behavioral health integration. *New Engl J Med.* 2017;376(5):405-407.

85. Levine DS, McCarthy JF, Cornwell B, Brockmann L, Pfeiffer PN. Primary Care-Mental Health Integration in the VA Health System: Associations Between Provider Staffing and Quality of Depression Care. *Psychiatr Serv.* 2017;68(5):476-481.