Journal of Primary Care & Community Health
2016, Vol. 7(4) 226–233

DOI: 10.1177/2150131916656155
jpc.sagepub.com
SAGE

Acute Care Utilization in Patients With Concurrent Mental Health and Complex Chronic Medical Conditions

Karen Abernathy[1], Jingwen Zhang[1], Patrick Mauldin[1], William Moran[1], Mac Abernathy[1], Elisha Brownfield[1], and Kimberly Davis[1]

Abstract

Objectives: Patients with coexisting mental health disorder and chronic disease are more at risk for poor outcomes, including increased acute care utilization. This study was performed to assess the association of mental health disorders on acute care utilization (emergency department [ED] use, hospitalization, and rehospitalization within 30 days) using disease clustering. **Methods:** A retrospective cohort analysis was performed on 10408 patients. Adult patients >18 years of age were included in the study if they were seen at least twice in University Internal Medicine primary care clinic at the Medical University of South Carolina from October 10, 2010 through September 30, 2013. The main outcome measure was a count of acute care use (hospital or ED). A linear regression model was used to fit a predictive model for ED and hospital utilization, and agglomerative hierarchical clustering was used to identify patients with similar comorbidities. **Results:** Covariates associated with increased risk of ED and hospital utilization include non-white race (rate ratio [RR] = 1.35, $P < .0001$), resident physician (RR = 1.30, $P < .0001$), and public insurance (RR = 1.56, $P < .0001$). Patients within the multiple chronic conditions (MCC), chronic obstructive pulmonary disease (COPD)/asthma, or renal disease clusters had 1.80 ($P < .0001$), 1.50 ($P < .0001$), and 2.57 ($P < .0001$) times, respectively, the amount of predicted utilization compared with healthy patients, whereas patients with a mental health diagnosis had 1.41 ($P < .0001$) times the predicted utilization. There was a significant association with increased utilization in patients with coexisting mental health disorder and chronic disease within the COPD/asthma (RR = 1.20, $P = .0038$), renal disease (RR = 1.27, $P < .0001$), and MCC (RR = 1.34, $P < .0001$) clusters. **Conclusions:** Patients with co-occurring chronic medical conditions and mental health disorders have higher rates of acute care utilization compared with patients with chronic medical conditions alone. Improving access to mental health care at the primary care clinic may have a positive impact on utilization.

Keywords

access to care, emergency visits, health outcomes, primary care, managed care

Introduction

Mental health disorders are one of the most common and debilitating conditions encountered in the primary care setting.[1] According to the National Survey of Drug Use and Health, 43.7 million adults (18.6% of all persons in the United States) suffered from mental illness in 2012.[2] Among adults diagnosed with mental illness, 68% also had one or more chronic medical diseases.[3] Data have shown that coexistence of mental health disorders and chronic disease is associated with poor adherence to treatment, worse outcomes, and increased mortality.[4] Furthermore, patients with untreated mental health disorders are more likely to develop hypertension, obesity, or diabetes, which substantially increases morbidity and health care costs.[3]

Improving access to mental health care in the primary care setting is essential as most patients with mental health disorders present initially to primary care physicians and are more likely to receive all of their care, including mental health, at the primary care office.[1] These patients may be inadequately treated or underdiagnosed due to limited time during clinic visits to address both medical problems and mental illness as well as lack of physician comfort in diagnosing and treating mental illness.[4] Patients referred to mental health may not receive treatment due to lack of patient follow through, increased cost, confidentiality concerns, and stigma associated with mental illness.[2] As a

[1]Medical University of South Carolina, Charleston, SC, USA

Corresponding Author:
Karen Abernathy, Division of General Internal Medicine and Geriatrics, Medical University of South Carolina, 135 Rutledge Avenue, Suite 1255, Charleston, SC 29425, USA.
Email: abernatk@musc.edu

result of the barriers to treatment within both primary care and mental health, only 41% of adults with a mental health disorder received treatment in 2012.[2]

The goal of this study is to use disease clustering within a population of patients with similar co-morbidities to compare acute care utilization and determine the effect that co-occurrence of mental health diagnosis and chronic disease may have on utilization within an Internal Medicine academic practice.

Methods

Study Population

Adults ≥18 years of age were eligible for the study if they were seen at least twice in the Medical University of South Carolina (MUSC) University Internal Medicine (UIM) primary care clinic from October 1, 2010 through September 30, 2013. Patients who died before September 30, 2013 were excluded; 10408 patients met eligibility criteria. Data were extracted from 4 local databases: Practice Partner Database (PPD) outpatient electronic medical record (EMR), EPIC outpatient EMR, Medical University Hospital Authority (MUHA) inpatient database, and IDX physician-scheduling database.

Primary Outcome Measure

Count of any acute care use (hospital or emergency department [ED]) at the Medical University Hospital from October 1, 2010 through September 30, 2013. Patients admitted to the psychiatric inpatient unit were excluded. Utilization was coded as a count variable by the sum of all ED and inpatient hospitalizations from the administrative data. Patients who present to the ED and are then hospitalized are only counted as a hospitalization.

Covariates

Gender, age, race, marital status, insurance status, patient place of residence (urban/rural), and poverty level by zip code were retrieved and coded as indicator variables. These covariates were chosen because they potentially affect patient well-being based on the "chronic care model."[5] Using enhanced ICD-9-CM (International Classification of Diseases, Ninth Revision, Clinical Modification) codes, comorbidity was derived from a modified Elixhauser coding algorithm, and separate dichotomous indicators for specific comorbidities were created. Mental health was coded by ICD-9 codes shown in Appendix B.

Defining Social Determinants

We had limited data on social determinants of care, so we used patient residence zip code matched with the 2010 census to determine poverty status of the patient's area of residence. The variable Poverty was given a value of 1 if that zip code has ≥25% of citizens below the federal poverty level (FPL) and the distance from the patients' zip code center point to the MUSC healthcare campus was calculated as a continuous variable.

Defining Outpatient Visit Compliance

Data for calculating visit adherence were retrieved from the IDX scheduling system. Visit adherence was a continuous variable defined as the sum of visits where patients arrived in the clinic, divided by the sum of visits scheduled after subtracting all visits "rescheduled by provider" and missed visits because the patient was in the ED or hospitalized. Visit compliance ranged from 0 to 1. When no visits were scheduled over the year, visit compliance was coded as 1.

Statistical Analysis

Clustering. Agglomerative hierarchical clustering was used to identify patient subgroups with similar comorbidities.[6,7] Each patient was forced into only one particular cluster. Cluster analysis has various algorithms[8,9]; for this study, Ward's minimum variance method was used to minimize variance within clusters. Mental health comorbidities were excluded from the clusters so that appropriate interactions could be measured. Interaction terms were created between significant clusters and mental health comorbidities to determine whether significant variations in utilization from clusters were driven by patients with mental health comorbidities.

The presence or absence of each of 32 comorbidities was presented with a 1 or 0 for each patient. Using Jaccard's coefficients in SAS, a dissimilarity matrix was created, which considers the number of specific comorbidities that 2 people have in common (eg, patients with obesity, hypertension, and hyperlipidemia) and ignores comorbidities that are not present in either patient. A 10-cluster solution is presented as the most clinically relevant number of clusters for the size and staffing of our practice. Following completion of the cluster analyses, each patient's cluster was incorporated into the risk stratification predictive model. Clusters 1, 2, 3, 5, 7, and 10 (Table 2) were combined together to serve as the reference cluster in the multivariate model.

Risk Stratification. A multivariable zero-inflated Poisson model was used to fit a predictive model for ED and hospital utilization. Rate ratio (RR) for the association between covariates and the count part and odds ratio (OR) for the association between covariates and the excess zero part were estimated using maximum likelihood. The mean predicted values of utilization were used to rank (descending order) patients into quintiles. While the clustering determines clinically "similar" patients within our practice, the risk stratification component allows for within-practice ranking of

Table 1. Sample Characteristics of Patient-Centered Medical Home University Internal Medicine Patients.

Demographics	Mental Health (N = 2904)	Non–Mental Health (N = 7504)	*P*
Age, years, mean ± SD	57.9 ± 15.6	58.1 ± 16.9	.4707
Male, n (%)	962 (33.1)	2878 (38.4)	<.0001
Non-white, n (%)	1526 (52.6)	3804 (50.7)	.0894
Married, n (%)	1039 (35.8)	3717 (49.5)	<.0001
Residence of rural, n (%)	111 (3.8)	313 (4.2)	.4195
Primary doctor being resident, n (%)	1786 (61.5)	3319 (44.2)	<.0001
Uninsured, n (%)	122 (4.2)	484 (6.5)	<.0001
Public insured, n (%)	2135 (73.5)	4082 (54.4)	<.0001
Distance, miles, mean ± SD	14.6 ± 21.7	15.2 ± 23.2	.2425
Visit compliance, mean ± SD	0.65 ± 0.19	0.71 ± 0.20	<.0001
Poverty, n (%)	894 (30.8)	1836 (24.5)	<.0001
Number of utilizations, mean ± SD	4.7 ± 11.6	1.4 ± 3.2	<.0001

clusters based on likelihood of utilization by patients within each cluster.

Results

Table 1 shows the demographic characteristics of the study population of 10 408 unique patients with mental health diagnosis or not. Demographic features included a mean age of 58 years, respectively for mental health and non–mental health patients, and a higher proportion of the mental health patients were female 67% vs. 62% ($p<0.0001$). There was a statistically significant difference in proportions of mental health patients to non–mental health patients with public insurance ($P < .0001$), if their physician was a resident ($P < .0001$), or they had higher visit compliance ($P < .0001$).

Table 2 describes 10 cluster subgroups using Ward's algorithm. There are 3 patient clusters with severe and dominant comorbidities such as cancer, chronic obstructive pulmonary disease (COPD)/asthma, and renal disease. One additional cluster was defined as multiple chronic conditions (MCC) by combinations of comorbidities, none of which were overwhelmingly dominant. High-risk patients comprised only 0.0% to 5.3% of patients within 6 clusters (hypertension/hyperlipidemia, hypothyroidism, obesity, and cardiovascular risk, healthy, and hypertension and obesity only in order). It was noted that the largest proportion of high utilization patients resides in the renal disease cluster (61%) but the largest number in the MCC cluster. The highest proportion of mental health patients falls in the renal disease cluster (45%), followed by the MCC cluster (38%) and COPD/asthma cluster (36%).

Table 3 presents the predictive model results based on the ZIP model in both the Poisson and zero components for all patients. Most covariates in both parts (zero and non-zero) were statistically significant. The renal disease cluster was the covariate most strongly associated with ED and hospital utilization as patients were 2.56 times more likely to need acute care than healthy patients. Patients within the MCC, COPD/asthma, and mental health clusters had 1.80, 1.50, and 1.41 times, respectively, the amount of predicted utilization. First order interactions were then assessed between mental health and disease clusters, and there was a significant and positive association with acute care utilization for mental health and 3 independent disease clusters (COPD, renal disease, and MCC) with RRs of 1.20, 1.27, and 1.34, respectively.

Discussion

Patients with mental health disorders, especially those with comorbid chronic disease, have worse outcomes leading to increased utilization of health care resources and higher cost to the health care system. The findings of this study reveal a significant and positive association between aggregated acute care utilization, chronic disease, and mental health disorders. The renal disease cluster had the strongest association with ED and hospital utilization. Other cluster covariates significantly associated with increased acute care utilization include male gender, higher age, non-white race, poor outpatient visit compliance and Medicare/Medicaid insurance. Patients within the MCC, COPD, and renal disease cluster were found to have a significant and positive association with increased acute care utilization if they had a coexisting mental health diagnosis. This suggests that these patients with chronic disease and co-occurring mental health disorder are at increased risk, and are more likely to need acute care than patients with chronic disease alone. Our findings are supported by previous studies demonstrating that patients with COPD or end-stage renal disease on hemodialysis have a higher rate of ED and hospital readmission if they have coexisting depression.[10,11] Interestingly, patients in the cancer cluster with co-occurring mental health disorder did not show any significant difference in

Table 2. Description of Patients Identified Through Cluster Analysis, With Mental Health Disorder and High-Risk Patient Subgroups (CLS = 10).

CLS No.	CLS Name	Most Frequent Conditions	n (%) of Patients	MH Patients (% Within CLS)	n (% Within CLS) of High-Risk Patients	n (% Within CLS) of MH High-Risk Patients
1	Hyperlipidemia and Hypertension	99.6% Hyperlipidemia 59.6% Hypertension 42.1% Obesity <1% Other conditions	1128 (10.8)	163 (14.5)	4 (0.4)	3 (0.3)
2	Hypertension and Obesity Only	100% Hypertension 51.1% Obesity 0% Other conditions	619 (6.0)	103 (16.6)	24 (3.9)	16 (2.6)
3	Healthy		1058 (10.2)	127 (12.0)	27 (2.6)	10 (0.9)
4	Multiple Chronic Conditions	72.0 % Hypertension 54.2% Hyperlipidemia 45.8% Obesity 40.0% FEDs 30.4% Diabetes 21.2% COPD 19.8% Cerebrovascular disease 19.8% Other neurological disorders 15.1% Deficiency anemia 14.8% CHF 14.2% Valvular disease <12% Other conditions	3259 (31.3)	1237 (38.0)	1100 (33.8)	802 (24.6)
5	Obesity Only	100% Obesity 0% Other conditions	511 (4.9)	66 (12.9)	27 (5.3)	13 (2.5)
6	Cancer	98.8% Solid tumor without metastasis 66.6% Hypertension 49.3% Hyperlipidemia 36.9% Obesity 30.5% Metastatic cancer 20.0% Hypothyroidism 19.4% Diabetes 17.9% FEDs <10% Other conditions	515 (5.0)	128 (24.9)	52 (10.1)	42 (8.2)
7	Obesity and CV Risk	98.9% Diabetes 79.8% Hypertension 73.1% Obesity 69.6% Hyperlipidemia 12.0% Diabetes, complicated <10% Other conditions	891 (8.6)	162 (18.2)	13 (1.5)	8 (0.9)

(continued)

Table 2. (continued)

CLS No.	CLS Name	Most Frequent Conditions	n (%) of Patients	MH Patients (% Within CLS)	n (% Within CLS) of High-Risk Patients	n (% Within CLS) of MH High-Risk Patients
8	COPD/Asthma	99.6% COPD 66.3% Hypertension 63.5% Asthma 53.3% Obesity 51.3% Hyperlipidemia 23.8% Diabetes 16.0% Hypothyroidism <10% Other conditions	972 (9.3)	350 (36.0)	191 (19.7)	144 (14.8)
9	Renal Disease	97.5% Renal failure 96.1% Hypertension 78.8% Hyperlipidemia 71.6% Hypertension, complicated 62.2% FEDs 61.9% Diabetes 50.9% Obesity 40.4% CHF 38.0% Diabetes, complicated 35.9% COPD 29.4% Deficiency Anemia 25.4% Valvular Disease 24.5% Cerebrovascular disease 24.0% PVD 21.3% MI <20% Other conditions	1042 (10.0)	465 (44.6)	638 (61.2)	402 (38.6)
10	Hypothyroidism	99.5% Hypothyroidism 43.3% Hypertension 41.4% Hyperlipidemia 37.5% Obesity <10% Other conditions	413 (4.0)	103 (24.9)	5 (1.2)	4 (1.0)

Abbreviations: CHF, congestive heart failure; CLS, cluster; COPD, chronic obstructive pulmonary disease; CV, cardiovascular; FEDs, fluid and electrolyte disorders; MH, mental health; MI, myocardial infarction; PVD, peripheral vascular disease.

Table 3. Regression Coefficients, *P* Value, Rate Ratio (RR), Odds Ratio (OR), and 95% Confidence Limits for Patient-Centered Medical Home University Internal Medicine Patients (CLS = 10).

	Nonzero Component[a]				Zero Component[b]			
	P	RR	Lower RR	Upper RR	*P*	OR	Lower OR	Upper OR
Intercept	<.0001	3.7106	3.3818	4.0715	0.4347	1.1292	0.8325	1.5314
Age	<.0001	0.9792	0.9783	0.9800	0.0021	1.0056	1.0020	1.0092
Non-white	<.0001	1.3507	1.3028	1.4005	0.0329	0.8714	0.7679	0.9889
Male	<.0001	1.1197	1.0886	1.1518	0.0158	1.1489	1.0263	1.2860
Unmarried	<.0001	1.1223	1.0857	1.1601	0.5504	0.9643	0.8557	1.0865
RES[c]	<.0001	1.3073	1.2563	1.3606	<.0001	0.6908	0.6080	0.7849
Rural	0.9477	0.9972	0.9163	1.0851	0.1165	1.2601	0.9441	1.6819
Uninsured	0.3100	0.9513	0.8640	1.0475	<.0001	1.5898	1.2635	2.0003
Public insured	<.0001	1.5619	1.4890	1.6384	<.0001	0.4821	0.4217	0.5512
Visit compliance	<.0001	0.5617	0.5217	0.6047	0.0005	1.6575	1.2455	2.2058
Distance	<.0001	0.9937	0.9928	0.9946	0.2140	1.0018	0.9990	1.0046
Poverty	<.0001	1.1273	1.0954	1.1601	0.0014	0.8118	0.7141	0.9228
Cluster_MCC	<.0001	1.7966	1.6962	1.9029	<.0001	0.4129	0.3545	0.4810
Cluster_CANCER	<.0001	1.8167	1.6269	2.0285	0.0027	0.6544	0.4961	0.8633
Cluster_COPD	<.0001	1.5019	1.3791	1.6356	<.0001	0.5486	0.4359	0.6905
Cluster_RD	<.0001	2.5690	2.4013	2.7483	<.0001	0.2510	0.1931	0.3263
Mental health (MH)	<.0001	1.4116	1.2993	1.5336	<.0001	0.6094	0.4919	0.7551
Cluster_MCC × MH	<.0001	1.3384	1.2207	1.4674	0.5903	0.9235	0.6913	1.2338
Cluster_CANCER × MH	0.2287	1.1066	0.9384	1.3049	0.4639	0.8104	0.4618	1.4222
Cluster_COPD × MH	0.0038	1.1997	1.0608	1.3570	0.3081	0.8054	0.5313	1.2210
Cluster_RD × MH	<.0001	1.2683	1.1480	1.4013	0.5260	0.8651	0.5528	1.3538

Abbreviations: CLS, cluster; COPD, chronic obstructive pulmonary disease; MCC, multiple chronic conditions; MH, mental health; OR, odds ratio; RD, renal disease; RR, rate ratio.

[a]Lower RR = lower limit CI (95%) for RR. Upper RR = upper limit CI (95%) for RR.

[b]Lower OR = lower limit CI (95%) for OR. Upper OR = upper limit CI (95%) for OR.

[c]RES was coded to 1 if primary care physician was resident.

utilization. One potential explanation for this finding is that more patients within the cancer cluster are otherwise healthy except for their cancer diagnosis, as opposed to the COPD, multiple chronic conditions and renal disease cluster patients who have multiple, often severe chronic diseases.

There are several limitations to this study that should be considered. First, mental health disorders are often underdiagnosed and may have a stronger negative impact on health care utilization than our data suggest. Second, this study is limited to a single academic Internal Medicine practice and may not be applicable to patients outside of the academic setting with differing disease severity, social determinants, or health care utilization. Third, the ED and hospitalization rate may be higher than reported as patients can seek care at other facilities. The potential impact of missing data from the results may undermine the validity of our findings. Fourth, we did not include age-related mental health disorders such as Alzheimer's disease, dementias, and associated psychiatric conditions in the ICD-9 codes, and these likely have a greater impact on acute care utilization in the elderly than our data suggest. Finally, the study demonstrates association not causation and unknown confounders may provide an alternative explanation for our results.

Traditionally, primary care and mental health have been distinct entities. Because of adoption of the Affordable Care Act and development of patient-centered medical homes in clinics across the nation, there has been increased focus on integrating primary care and mental health services in an effort to treat the "whole patient." The integration of primary care and mental health care is defined in the Lexicon for Behavioral Health and Primary Care Integration as "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."[12] There is a large body of evidence concluding that integration of mental health providers into primary care with on-site collaboration has a significant improvement in patient care. Results from a Cochrane Review published in 2012 analyzing 79 randomized controlled trials demonstrated improved outcomes for patients treated with integrated care.[13] Other studies have shown increased adherence to treatment, improved quality of life, and improved patient satisfaction in patients treated at primary care clinics with integrated mental health.[14]

Mental health disorders have a significant impact on physical health and lead to increased health care utilization,

especially among patients with chronic disease such as COPD and renal disease. Patients with mental health disorders need improved access to mental health care, and there is rising interest in providing this directly at the primary care level.[4] A collaborative care approach utilizing integration of mental health care into the primary care clinic has been shown to be effective in improving outcomes, patient satisfaction, and quality of life and may lead to implementation of more effective ways to manage mental health disorders in complex patients.

Appendix A

Comorbidities	Mental Health (N = 2904); n (%)	Non–Mental Health (N = 7504); n (%)	*P*
Obesity (OBE)	1425 (49.1)	3414 (45.5)	.0010
Congestive Heart Failure (CHF)	469 (16.2)	504 (6.7)	<.0001
Valvular Disease (VD)	373 (12.8)	417 (5.6)	<.0001
Pulmonary Circulation Disorders (PCD)	261 (9.0)	240 (3.2)	<.0001
Peripheral Vascular Disorders (PVD)	321 (11.1)	364 (4.9)	<.0001
Hypertension, Uncomplicated (HU)	2131 (73.4)	4385 (58.4)	<.0001
Hypertension, Complicated (HC)	404 (13.9)	389 (5.2)	<.0001
Paralysis (PAR)	125 (4.3)	133 (1.8)	<.0001
Other Neurological Disorders (OND)	503 (17.3)	408 (5.4)	<.0001
Chronic Obstructive Pulmonary Disease (COPD)	1003 (34.5)	1083 (14.4)	<.0001
Diabetes, Uncomplicated (DU)	1008 (34.7)	1852 (24.7)	<.0001
Diabetes, Complicated (DC)	376 (13.0)	400 (5.3)	<.0001
Hypothyroidism (HYPO)	486 (16.7)	837 (11.2)	<.0001
Renal Failure (RF)	542 (18.7)	713 (9.5)	<.0001
Liver Disease (LD)	294 (10.1)	252 (3.4)	<.0001
Peptic Ulcer Disease excluding bleeding (PUD)	186 (6.4)	127 (1.7)	<.0001
AIDS/HIV (HIV)	54 (1.9)	44 (0.6)	<.0001
Lymphoma (LYM)	46 (1.6)	76 (1.0)	.0152
Metastatic Cancer (MC)	107 (3.7)	155 (2.1)	.1530
Solid Tumor without Metastasis (ST)	392 (13.5)	698 (9.3)	.0076
Rheumatoid Arthritis/collagen Vascular Diseases (RHA)	249 (8.6)	339 (4.5)	<.0001
Coagulopathy (COAG)	226 (7.8)	170 (2.3)	.0001
Weight Loss (WL)	355 (12.2)	268 (3.6)	<.0001
Fluid and Electrolyte Disorders (FED)	1093 (37.6)	1038 (13.8)	<.0001
Blood Loss Anemia (BLA)	74 (2.6)	45 (0.6)	<.0001
Deficiency Anemia (DA)	418 (14.4)	468 (6.2)	<.0001
Asthma	552 (19.0)	575 (7.7)	<.0001
Hyperlipidemia (HYP)	1629 (56.1)	3625 (48.3)	<.0001
Sickle Cell	80 (2.8)	96 (1.3)	<.0001
Myocardial Infarction (MI)	323 (11.1)	272 (3.6)	<.0001
Dementia (DEM)	39 (1.3)	23 (0.3)	<.0001
Cerebrovascular Disease (CD)	459 (15.8)	516 (6.9)	<.0001

Appendix B

Comorbidities	Enhanced ICD-9-CM
Alcohol abuse	265.2, 291.1-291.3, 291.5-291.9, 303.0, 303.9, 305.0, 357.5, 425.5, 535.3, 571.0-571.3, 980.x, V11.3
Drug abuse	292.x, 304.x, 305.2-305.9, V65.42
Psychoses	293.8, 295.x, 297.x, 298.x
Depression and mood disorders	296.04, 296.14, 296.2, 296.3, 296.44, 296.54, 296.5, 300.4, 309.x, 311

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

1. Ansseau M, Dierick M, Buntinkx F, et al. High prevalence of mental disorders in primary care. *J Affect Disord*. 2004;78:49-55.
2. Substance Abuse and Mental Health Services Administration. *Results From the 2012 National Survey on Drug Use and Health: Mental Health Findings* (NSDUH Series H-46, HHS Publication No. (SMA) 13-4795). Rockville, MD: Substance Abuse and Mental Health Services Administration; 2013.
3. Alegria M, Jackson JS, Kessler RC, Takeuchi D. *Collaborative Psychiatric Epidemiology Surveys (CPES), 2001-2003* [United States]. ICPSR20240-v8. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]; 2015. doi:10.3886/ICPSR20240.v8.
4. WHO and Wonca Working Party on Mental Health. What is primary care mental health? *Ment Health Fam Med*. 2008;5:9-13.
5. Wagner EH, Austin BT, Von Korff M. Organizing care for patients with chronic illness. *Milbank Q*. 1996; 74:511-544.
6. Newcomer SR, Steiner JF, Bayliss EA. Identifying subgroups of complex patients with cluster analysis. *Am J Manag Care*. 2011;17:e324-e332.
7. Press WH, Teukolsky SA, Vetterling WT, Flannery BP. *Numerical Recipes: The Art of Scientific Computing*. 3rd ed. New York, NY: Cambridge University Press; 2007.
8. Aldenderfer MS, Blashfield RK. *Cluster Analysis*. Beverly Hills, CA: Sage; 1984.
9. Moran WP, Zhang J, Gebregziabher M, et al. Chaos to complexity: leveling the playing field for measuring value in primary care [published online February 4, 2015]. *J Eval Clin Pract*. 2015;doi:10.1111/jep.12298.
10. Dalal AA, Shah M, Lunacsek O, Hanania NA. Clinical and economic burden of depression/anxiety in chronic obstructive pulmonary disease patients within a managed care population. *COPD*. 2011;8:293-299.
11. Abbas TS, Ebrahimnia M, Shamspour N, Assari S. Effect of depression on health care utilization in patients with end-stage renal disease treated with hemodialysis. *Eur J Intern Med*. 2009;20:411-414.
12. Peek CJ, The National Integration Academy Council. *Lexicon for Behavioral Health and Primary Care Integration: Concepts and Definitions Developed by Expert Consensus* (AHRQ Publication No. 13-IP001-EF). Rockville, MD: Agency for Healthcare Research and Quality. 2013. http://integrationacademy.ahrq.gov/sites/default/files/Lexicon.pdf. Accessed August 30, 2015.
13. Archer J, Bower P, Gilbody S, et al. Collaborative care for depression and anxiety problems. *Cochrane Database Syst Rev*. 2012;10:CD006525.
14. Thota AB, Sipe TA, Byard GJ, et al; Community Preventive Services Task Force. Collaborative care to improve the management of depressive disorders: a community guide systematic review and meta-analysis. *Am J Prev Med*. 2012;42:525-538.

Author Biographies

Karen Abernathy is an instructor at the University Internal Medicine primary care clinic, in the Division of General Internal Medicine and Geriatrics, Department of Medicine at the Medical University of South Carolina.

Jingwen Zhang is a research instructor in the Division of General Internal Medicine and Geriatrics, Department of Medicine at the Medical University of South Carolina.

Patrick Mauldin is professor and director of the Section of Health Systems Research and Policy within the Division of General Internal Medicine and Geriatrics, Department of Medicine at the Medical University of South Carolina.

William Moran is professor of medicine and division director of the Division of General Internal Medicine and Geriatrics, Department of Medicine at the Medical University of South Carolina. He has served as President of the Society of General Internal Medicine (SGIM) and the Association of Chiefs of General Internal Medicine (ACLGIM), and the ACLGIM and SGIM Councils.

Mac Abernathy is currently a fifth year resident in the combined Neurology/Psychiatry residency program at the Medical University of South Carolina.

Elisha Brownfield is an associate professor of medicine at the University Internal Medicine primary care clinic, in the Division of General Internal Medicine and Geriatrics, Department of Medicine at the Medical University of South Carolina. She has served as the President of the Society of General Internal Medicine (SGIM) southern region.

Kimberly Davis is an associate professor of medicine and the clinical director for the University Internal Medicine primary care clinic, in the Division of General Internal Medicine and Geriatrics, Department of Medicine at the Medical University of South Carolina.