Behavioral Health Disorders and Adherence to Measures of Diabetes Care Quality

Gary Y. Leung, PhD; Jianying Zhang, MD, MPH; Wen-Chieh Lin, PhD;
and Robin E. Clark, PhD

Objective: To investigate whether Medicare and/or Medicaid beneficiaries with behavioral health disorders (BHDs) receive lower quality diabetes care.

Study Design: Retrospective observational study using merged Medicare and Medicaid claims data from Massachusetts in calendar years 2004 and 2005.

Methods: The study included beneficiaries who had type 2 diabetes, stayed at nursing homes for fewer than 90 days, and were enrolled in Medicare and/or Medicaid for at least 10 months during the study period. We used *Current Procedural Terminology* (*CPT*) codes to identify the receipt of 4 measures of diabetes care quality (ie, glycated hemoglobin tests, low-density lipoprotein cholesterol tests, nephropathy tests, eye examinations). The rates of adherence (defined by proportions of beneficiaries receiving appropriate services for each measure) were compared across different types of BHDs as identified by *International Classification of Diseases, Ninth Revision, Clinical Modification* diagnoses. Multivariate logistic regression was used to compare the odds of adherence among beneficiaries who had BHDs with the odds among beneficiaries who had no BHDs, while adjusting for case mix.

Results: A total of 106,174 individuals met inclusion criteria. Results from adjusted analysis showed a mixed picture of the relationships between BHDs and adherence to quality measures. While substance use disorders were associated with lower adherence to quality measures, beneficiaries with diagnoses of schizophrenia or paranoid states had higher odds for adherence to quality measures.

Conclusions: Individuals with diabetes and substance use disorders receive lower quality diabetes care. Further studies to examine the factors associated with this disparity are needed.

(Am J Manag Care. 2011;17(2):144-150)

For author information and disclosures,
see end of text.

E vidence suggests that individuals with behavioral health disorders (BHDs) may receive substandard care for chronic physical illnesses.[1-5] Several studies indicate that BHDs, which include depression, schizophrenia, bipolar disorder, anxiety disorders, and substance use disorders (SUDs), are associated with difficulties in accessing care[2,6,7] and in communicating with primary care physicians.[8,9] The barriers that people with BHDs encounter may contribute to (1) their low rates of receiving community-based care and (2) heavy utilization of inpatient care and frequent visits to emergency departments.[10] Consequently, healthcare expenditures for people with BHDs, especially those with SUD, are high[11] and have been rising in recent years.[12]

Some studies show that individuals with BHDs receive poorer quality diabetes care, as indicated by lower rates of adherence to Health Effectiveness Data and Information Set (HEDIS) measures of diabetes care quality.[13-15] These measures recommended by the National Committee for Quality Assurance include receiving each of the 6 services or tests: glycated hemoglobin (A1C) tests, low-density lipoprotein cholesterol (LDL-C) tests, nephropathy screening/urine profile, blood pressure check, and eye and foot examinations.[16] For example, Jones and colleagues found that people with diabetes and co-occurring BHDs were less likely to receive A1C tests and LDL-C tests than those with diabetes alone.[13] Goldberg and colleagues reviewed medical charts in a community sample and showed that people with diabetes and schizophrenia were less likely to receive all 6 services than people with diabetes alone.[14] Frayne and colleagues analyzed administrative data and observed that people with schizophrenia were less likely to achieve adherence to all measures.[15] These studies suggest that individuals with BHDs face obstacles in receiving proper diabetes care and may require targeted interventions to improve diabetes care quality.

No studies to date have examined the associations between BHDs and diabetes care quality in Medicare or Medicaid populations. This is of serious concern because these are vulnerable populations with high rates of mental health disorders,[17,18] and they may be at higher risk of worse health outcomes. Further, large portions of Medicaid populations in most states are enrolled in some form of managed care,[19] and participation in Medicare Advantage managed

In this article
Take-Away Points / p145
www.ajmc.com
Full text and PDF
Web exclusive
eAppendix

care plans is growing.[20] Managed care organizations are increasingly accountable for the quality of care among high-risk beneficiaries.[21] Effective management of chronic diseases is crucial in controlling healthcare costs.

However, it is still unclear whether BHDs are associated with poorer quality diabetes care, because other studies found contrary results.[22,23] Dixon and colleagues observed that people with diabetes and schizophrenia had better glycemic control, indicated by lower A1C levels, than those with diabetes alone.[22] Further, Kreyenbuhl and colleagues showed that glycemic control among people with BHDs was not significantly different from that among people with diabetes alone.[23] These different observations may be due to unmeasured confounders.

It is worth noting that none of the previously mentioned studies adjusted for SUD.[13-15,22,23] It is possible that SUD confounded the relationship between schizophrenia and adherence to quality measures. Therefore, further research is needed to delineate the relationship between BHDs and diabetes care quality. By identifying the areas of health disparities and the factors associated with them, appropriate interventions can be designed to improve outcomes in diabetes care.

This study investigated the relationship between BHDs and adherence to measures for diabetes care quality in Massachusetts residents with Medicare and/or Medicaid coverage during 2005. Rates of adherence to HEDIS measures of diabetes care quality, as indicated by the proportion of beneficiaries receiving the services or tests for monitoring diabetes, were compared across different BHD diagnostic groups using multivariate analyses to adjust for potential confounders.

METHODS

Study Design and Data

This was a retrospective observational study using individual-level administrative data from Medicare and Medicaid populations in Massachusetts during calendar years 2004 and 2005. Medicare claims were obtained from the Centers for Medicare & Medicaid Services. Medicaid claims were obtained from the Massachusetts Medicaid Management Information System. Socioeconomic status data for beneficiaries' ZIP code–based community (ie, median household income in 1999 and percentage of high school graduates) came from Census 2000.

Selection Criteria

We included beneficiaries who were at least 18 years old as of January 1, 2004. The study population was characterized by their Medicare and Medicaid coverage. The Medicare-only group included beneficiaries who enrolled in Parts A and B for at least 10 months during both calendar year 2004 and 2005 and did not enroll in Medicaid. Beneficiaries with Medicaid only were enrolled in Medicaid for at least 10 months during both years with no Medicare enrollment. Dually eligible beneficiaries were enrolled in Medicare Part A and Medicaid for at least 10 months during both years. The length of enrollment requirement ensured stable health coverage in the study population. Beneficiaries with Medicare Advantage (managed care) or residing in nursing homes for 90 days or more were excluded because adequate claims were unavailable.

All beneficiaries with type 2 diabetes were identified by either 1 diagnosis on an inpatient claim or 2 diagnoses on outpatient claims (*International Classification of Diseases, Ninth Revision, Clinical Modification* [*ICD-9-CM*] codes 250.xx, 357.2, 362.0, 362.01, 362.02, 366.41, and 648.0). The choice of diagnostic codes is consistent with previously published studies.[13,15] We could not link 2263 individuals to a census area and they were excluded from the study. As a result, the study included 106,174 individuals.

Identification and Classification of Behavioral Health Disorders

Behavioral health disorders were also identified by any 1 inpatient *ICD-9-CM* diagnosis or any 2 outpatient diagnoses. Mental health disorders included schizophrenia/paranoid states (*ICD-9-CM* 295.x, 297.x), bipolar disorder (*ICD-9-CM* 296.0, 296.1, 296.4-296.7), depression/anxiety (*ICD-9-CM* 296.2, 296.3, 298.0, 300.01, 300.02, 300.4, 309.0, 309.1, 309.81, 311.x), and other mental health disorders (*ICD-9-CM* 298.1-298.4, 298.8-298.9, 300.1, 300.2, 300.3, 300.5-300.9, 301.x, 302.x, 306.x-308.x, 309.2-309.4, 309.82, 309.83, 309.89, 309.9, 312.x-316.x). They were categorized hierarchically: schizophrenia/paranoid > bipolar disorder > depression/anxiety > other mental health disorders. Individuals with no mental health disorders were the reference group. Substance use disorders included alcohol abuse/dependence (*ICD-9-CM* 291.x, 303.x, 305.0, 571.0-571.3) (reference group: no alcohol abuse/dependence) and drug abuse/dependence (*ICD-9-CM* 292.x, 304.x, 305.2-305.9, 648.3) (reference group: no drug abuse/dependence).

A subanalysis was performed using medication data to identify mental health disorders and to assess any differences in estimates of outcomes based on different case identification methods.

Identification of Quality Measures for Diabetes Care

Using *Current Procedural Terminology* (*CPT*) codes, we assessed adherence to 4 measures for diabetes care quality: having an A1C test, an LDL-C test, a nephropathy test, and an eye examination (no appropriate *CPT* or *ICD-9-CM* codes available for foot examinations or blood pressure checks in 2005 Medicare and Medicaid data for Massachusetts). Beneficiaries who had at least 1 claim for a test or examination during 2005 were considered to be adherent to that measure during 2005. A summary measure was created to indicate full adherence to quality measures, defined as having all 4 procedures during calendar year 2005.

Covariates

The following covariates were obtained from Medicare or Medicaid data: sex; race/ethnicity (white, African American, Hispanic, and other); age; physical illness burden (represented by the Chronic Illness and Disability Payment System [CDPS] and computed from claims[24]); preexisting diabetes-related complications (eye complications, nephropathy, neuropathy, lower-limb amputation, ischemic heart disease, and cerebrovascular disease) identified by *ICD-9-CM* codes; types of health coverage; and frequency of physician visits. See the eAppendix at www.ajmc.com for a list of codes used to identify diabetes complications. In computing the CDPS scores, the diagnoses of BHDs were omitted so that the analyses could investigate the effects of BHDs on outcomes separate from the effects of other illnesses. Treatment is likely to vary by practice or by provider. Because we were unable to identify specific providers across Medicaid and Medicare claims, we used Hospital Service Areas (HSAs) as a clustering variable to approximate small area variations in care.[25] Median household income and percentage of high school graduates in beneficiaries' ZIP code–based communities were included as a proxy measure of the beneficiaries' socioeconomic status.

Statistical Analysis

Unadjusted analyses were performed to compare the distributions of covariates and outcomes across mental disorder categories (analysis of variance, χ^2, or Kruskal-Wallis tests), as well as between mental health disorders and no mental health disorders (*t* tests, χ^2 tests, or Kruskal-Wallis tests). We used logistic regression to examine the effects of BHDs on the individual outcomes as well as the summary measure, ad-

justing for covariates. We included robust variance estimates in the model to account for the correlations in the patterns of care among patients within HSAs.[25] Hospital Service Areas are defined by the areas where local residents received most of their hospital care.[26] In adjusted analyses, age was categorized into 4 groups: <55, 55 to 64, 65 to 74, and ≥75 years, based on classifications used in other studies such as that by Frayne and colleagues.[15] Chronic Illness and Disability Payment System scores were divided into quartiles (lowest burden: CDPS <0.8). All statistical analyses were performed using STATA version 10 (StataCorp LP, College Station, TX).

RESULTS

Of the 106,174 Medicare and Medicaid beneficiaries with diabetes, 28.0% (n = 29,772) had mental health disorders and 5.1% (n = 5414) had SUDs. The most prevalent mental health disorder group was depression/anxiety (19%, n = 19,690; see **Table 1**). The rate of comorbid SUD was highest among beneficiaries with bipolar disorder (26%). Beneficiaries with diabetes and mental health disorders were younger (average age ranged from 52 to 65 years) than those with diabetes alone (average age was 70 ± 13 years).

Table 2 illustrates the rates of adherence to measures of diabetes care quality across mental health disorders in 2005. Beneficiaries with mental health disorders were less likely to achieve full adherence than those without mental health disorders (19%-22% vs 25%, respectively; *P* <.001). The rates of adherence to A1C testing were lower among beneficiaries with mental health disorders (64%-72%) than among those with no mental health disorders (76%). Lower proportions of beneficiaries with mental health disorders (61%-68%) had at least 1 LDL-C test in 2005 compared with beneficiaries who had no mental health disorders (73%). Lower rates of adherence to eye examinations were found among beneficiaries with mental health disorders (42%-54%) than among those with no mental health disorders (61%). However, a higher proportion of beneficiaries with mental health disorders had a nephropathy test (49%-51% vs 47%).

In adjusted analyses, beneficiaries with schizophrenia/paranoid states had higher odds of adherence to quality measures, whereas beneficiaries with depression/anxiety and other mental health disorders had lower odds of adherence. For example, the likelihood of full adherence to quality measures in 2005 was lower in beneficiaries with depression/anxiety (odds ratio [OR] = 0.95; 95% confidence interval [CI], 0.90-1.00) and other mental health disorders (OR = 0.88; 95% CI, 0.79-0.98) than it was among those who had no mental health disorders. On the other hand, the likelihood of full adherence to quality measures in 2005 was higher among individuals with schizo-

■ **Table 1.** Characteristics of Beneficiaries by Mental Disorder Categories

Characteristic[a]	No Mental Health Disorders, No. (%)[b] (n = 76,402)	Schizophrenia/ Paranoid States (n = 3811) No. (%)[b]	P[c]	Bipolar Disorder (n = 3151) No. (%)[b]	P[c]	Depression/Anxiety (n = 19,690) No. (%)[b]	P[c]	Other Mental Health Disorders (n = 3120) No. (%)[b]	P[c]
Substance use disorders[d]	1578 (2)	866 (22)	<.001	830 (26)	<.001	1995 (10)	<.001	172 (6)	<.001
Mean (SD) age, y[e]	70 (13)	52 (13)	<.001	53 (15)	<.001	61 (16)	<.001	65 (16)	<.001
Male[d]	35,008 (46)	1855 (49)	<.01	1131 (36)	<.001	6121 (31)	<.001	1538 (49)	<.001
Race/ethnicity[d]			<.001		<.001		<.001		<.001
Non-Hispanic white		2879 (76)		2586 (82)		15,653 (80)		2467 (79)	
African American	5534 (7)	570 (15)		236 (7)		1359 (7)		284 (9)	
Hispanic	2716 (4)	148 (4)		119 (4)		1357 (7)		165 (5)	
Other	2634 (3)	85 (2)		40 (1)		507 (3)		72 (2)	
Unknown	2585 (3)	129 (3)		170 (5)		814 (4)		132 (4)	
Mean (SD) CDPS score[f]	1.5 (1.1)	1.5 (1.1)	<.05	1.8 (1.3)	<.001	1.8 (1.3)	<.001	1.9 (1.4)	<.001
Disabled[d]	16,087 (21)	3313 (87)	<.001	2258 (72)	<.001	9461 (48)	<.001	1070 (34)	<.001
Health coverage[d]			<.001		<.001		<.001		<.001
Medicare only	50,376 (66)	375 (10)		588 (19)		7205 (37)		1593 (51)	
Medicaid only	11,997 (16)	1472 (39)		1318 (42)		6725 (34)		790 (25)	
Dually eligible	14,029 (18)	1964 (52)		1245 (40)		5760 (29)		737 (24)	
Continuous 12-month coverage[d]	73,581 (96)	3727 (98)	<.001	2969 (94)	<.001	18,686 (95)	<.001	2947 (94)	<.001
Median (SD) house-hold income[e]	49,625 (17,605)	43,584 (15,234)	<.001	44,928 (15,539)	<.001	45,211 (17,163)	<.001	48,839 (17,917)	<.05
Average (SD) percentage of high school graduates[e]	82 (11)	79 (12)	<.001	80 (12)	<.001	79 (12)	<.001	82 (11)	.1
Any previous complications[d]	41,447 (54)	1279 (34)	<.001	1237 (39)	<.001	10,077 (51)	<.001	1806 (58)	<.001
Eye complications in 2004[d]	13,189 (17)	343 (9)	<.001	300 (10)	<.001	2943 (15)	<.001	523 (17)	.5
Neuropathy in 2004[d]	10,697 (14)	413 (11)	<.001	409 (13)	.1	3138 (16)	<.001	531 (17)	<.001
Nephropathy in 2004[d]	3946 (5)	126 (3)	<.001	103 (3)	<.001	984 (5)	.3	205 (7)	<.01
Lower-limb amputa-tions in 2004[d]	3722 (5)	224 (6)	<.01	206 (7)	<.001	1346 (7)	<.001	286 (9)	<.001
Ischemic heart disease in 2004[d]	25,564 (33)	515 (14)	<.001	616 (20)	<.001	5785 (29)	<.001	1094 (35)	.06
Cerebrovascular disease in 2004[d]	8117 (11)	150 (4)	<.001	218 (7)	<.001	2099 (11)	.9	522 (17)	<.001
Average (SD) number of physician visits in 2004[f]	7.4 (6.6)	6.5 (7.0)	<.001	8.4 (9.1)	<.05	8.7 (8.1)	<.001	8.4 (7.7)	<.001

CDPS indicates Chronic Illness and Disability Payment System.
[a]P <.001 for all comparisons across mental health disorder categories.
[b]Values are number (percentage) unless indicated otherwise.
[c]Compared with no mental health disorders.
[d]χ^2 tests were used for all comparisons.
[e]t tests were used for pairwise comparisons; analysis of variance for comparisons across mental health disorder categories.
[f]Kruskal-Wallis tests were used for all comparisons.

■ **Table 2.** Adherence to Measures of Diabetes Care Quality Among Beneficiaries by Mental Disorder Category[a]

Measure[b]	No Mental Health Disorders, No. (%) (n = 76,402)	Schizophrenia/ Paranoid States (n = 3811)		Bipolar Disorder (n = 3151)		Depression/Anxiety (n = 19,690)		Other Mental Health Disorders (n = 3120)	
		No. (%)	P[c]	No. (%)	P[c]	No. (%)	P[c]	No. (%)	P[c]
Full adherence in 2005	18,962 (25)	717 (19)	<.001	586 (19)	<.001	4200 (21)	<.001	678 (22)	<.001
Any A1C test in 2005	58,175 (76)	2750 (72)	<.001	2017 (64)	<.001	13,405 (68)	<.001	2229 (71)	<.01
Any nephropathy test in 2005	35,987 (47)	1903 (50)	<.01	1611 (51)	<.001	9558 (49)	<.001	1505 (48)	.2
Any LDL-C test in 2005	55,642 (73)	2586 (68)	<.001	1914 (61)	<.001	12,507 (64)	<.001	2013 (65)	<.001
Any eye exam in 2005	46,726 (61)	1673 (44)	<.001	1316 (42)	<.001	9984 (51)	<.001	1689 (54)	<.001

A1C indicates glycated hemoglobin; LDL-C, low-density lipoprotein cholesterol.
[a]χ^2 tests were used for all comparisons.
[b]P <.001 for all comparisons across mental health disorder categories.
[c]Compared with no mental health disorders.

phrenia/paranoid states (OR = 1.22; 95% CI, 1.08-1.37) than it was among those who had no mental health disorders.

Table 3 shows some variation across specific measures and diagnoses. Beneficiaries with alcohol and drug use disorders had lower odds of adherence for LDL-C testing (OR for alcohol abuse/dependence = 0.82, 95% CI, 0.76-0.89; OR for drug abuse/dependence = 0.84, 95% CI, 0.74-0.95), eye examination (OR for alcohol abuse/dependence = 0.80, 95% CI, 0.74-0.86; OR for drug abuse/dependence = 0.71, 95% CI, 0.65-0.78) and full adherence (OR for alcohol abuse/dependence = 0.79, 95% CI, 0.71-0.86; OR for drug abuse/dependence = 0.67, 95% CI, 0.59-0.76).

Sensitivity Analysis

Besides diagnostic codes, medication data can be used to identify mental health disorders. An example is the Medicaid Rx model by Gilmer and colleagues.[27,28] An exploratory analysis on individuals receiving Medicaid (ie, Medicaid alone and dual eligibles) was performed to compare the estimates from the Medicaid Rx models[28] for the association between mental health disorders and full adherence to quality measures with the estimates obtained by using *ICD-9-CM* codes. The results showed no significant differences using the 2 case identification methods.

The data were analyzed with and without variables derived from census data to determine the impact of excluding cases that could not be linked to census areas. Results were similar for the 2 models.

DISCUSSION

The analyses showed that the relationships between mental health disorders and adherence to quality measures varied depending on the type of BHD as well as the measure of interest. While schizophrenia/paranoid states were associated with increased odds of adherence to all quality measures, depression/anxiety or other mental health disorders were correlated with lower odds of LDL-C tests and eye examinations. Bipolar disorder was not significantly associated with adherence to most quality measures, except nephropathy tests. Similar to those with depression/anxiety, beneficiaries with SUD had lower odds of having LDL-C tests and eye examinations. Similar associations between quality measures (eg, LDL-C tests, eye examinations) and BHDs (eg, SUD,[3,13,15] depression/anxiety,[13,15] other mental health disorders[13]) have also been reported in previous studies.

Contrary to some previous research, this study did not show that beneficiaries with schizophrenia/paranoid states had lower odds of adherence to measures of diabetes care quality. A possible explanation is that there was a change in practice among clinicians regarding the treatment of patients with co-occurring mental health disorders. Previous studies showed that the use of psychotropic medications, especially antipsychotics, was associated with increased risk of metabolic dysfunction, such as hyperglycemia and hyperlipidemia, particularly among people with diabetes.[29,30] New clinical practice guidelines for managing physical health among people with schizophrenia were adopted in 2004 by the American Diabetes Association and the American Psychiatric Association, largely due to increased risk associated with psychotropic medications.[31] Clinicians may have become more vigilant about monitoring diabetes in their patients with schizophrenia after these guidelines were adopted.

Consistent with previous research, beneficiaries with SUDs were less likely to achieve adherence to quality measures.[31] It

■ Table 3. Associations Between Behavioral Health Disorders and Adherence to Quality Measures[a]

Mental Health Disorder (N = 106,174)	Full Adherence		A1C Test		LDL-C Test		Nephropathy Test		Eye Examination	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
No mental health disorders (reference)	1		1		1		1		1	
Schizophrenia/paranoid states	1.22[b]	1.08-1.37	1.51[c]	1.38-1.66	1.55[c]	1.42-1.69	1.39[c]	1.28-1.50	1.19[b]	1.06-1.33
Bipolar disorder	1.05	0.95-1.15	0.98	0.89-1.07	1.08	0.97-1.19	1.34[c]	1.23-1.45	0.94	0.87-1.03
Depression/anxiety	0.95[d]	0.90-1.00	0.89[b]	0.83-0.96	0.91[d]	0.85-0.98	1.10[c]	1.05-1.15	0.93[d]	0.87-0.99
Other mental health disorders	0.88[d]	0.79-0.98	0.94	0.86-1.02	0.84[c]	0.76-0.92	1.02	0.94-1.11	0.91[d]	0.85-0.98
Alcohol abuse/dependence	0.79[c]	0.71-0.86	0.92	0.84-1.01	0.82[c]	0.76-0.89	1.06	1.00-1.14	0.80[c]	0.75-0.86
Drug abuse/dependence	0.67[c]	0.59-0.76	0.90	0.79-1.02	0.84[b]	0.74-0.95	1.18[c]	1.09-1.28	0.71[c]	0.65-0.78

A1C indicates glycated hemoglobin; CI, confidence interval; LDL-C, low-density lipoprotein cholesterol; OR, odds ratio.
[a] All regression models were adjusted for sex, race/ethnicity (white, African American, Hispanic, and other), age groups, the Chronic Illness and Disability Payment System score in quartiles, preexisting diabetes-related complications (eye complications, nephropathy, neuropathy, lower-limb amputation, ischemic heart disease, and cerebrovascular disease), types of health coverage (Medicare only, Medicaid only, and dually eligible), and frequency of physician visit.
[b] $P < .01$.
[c] $P < .001$.
[d] $P < .05$.

is crucial to realize that diabetes care quality is affected by both patient compliance and physician behavior. A previous study by Frayne and colleagues showed that individuals with SUD had poorer control of A1C levels.[15] Other studies have shown that diabetes self-care is essential in maintaining proper A1C levels.[32-34] Ahmed and colleagues observed that increased alcohol consumption in people with diabetes was associated with poorer self-care behaviors, such as lower rates of adherence to oral hypoglycemics and self-monitoring of blood glucose.[35] However, this study assessed whether beneficiaries received the tests or examinations for diabetes monitoring, which need to be ordered or performed by physicians and are not related to self-care. Therefore, physician attitudes may influence how diabetes is managed in people with SUD. In a study by Krebs et al, physicians were 3 times more likely to regard a patient visit as difficult if the patient had SUD.[9] Other studies suggested that physician attitudes might affect patient care. Jackson and Kroenke observed that patients were more likely to have unmet expectations (eg, about having tests or getting diagnoses) after a difficult encounter with their physician.[36] Thus, SUD may affect both patients' and physicians' adherence to best practice.

However, our findings showed that beneficiaries with drug abuse/dependence had higher odds of receiving nephropathy tests. Because nephropathy tests are performed on urine samples, they may be ordered along with routine drug screens. Further studies should investigate whether quality of diabetes care improves after individuals with SUD receive addiction treatment.

One limitation of this study was its reliance on administrative data. It is possible that the study underestimated the adherence rates to quality measures among beneficiaries be-

cause some of the procedures or tests performed did not appear on claims. In previous studies comparing the rates of patient adherence to quality measures indicated by claims data with the rates indicated by medical records, some underdetection of diabetes care services was observed when only claims data were used.[37,38] Another limitation is the lack of laboratory data on A1C or LDL-C control because proper control of A1C and LDL-C levels is part of diabetes care quality. Further investigation of data on A1C and LDL-C control is necessary to assess diabetes care quality in this population. Another weakness was that the study was not able to assess the socioeconomic status of individual beneficiaries. Data from Census 2000 were used as proxy for community socioeconomic conditions.

The major strength of the current study is the use of population-based data; hence, the results may be applicable to other Medicare and Medicaid populations with demographic composition and Medicaid programs similar to those in Massachusetts. In addition, the size of the study population provided sufficient confidence in detecting any significant relationships between the BHDs and adherence to quality measures.

CONCLUSION

Evidence suggests that Medicare/Medicaid beneficiaries with SUDs or mental health disorders other than schizophrenia/paranoid states were less likely to receive laboratory tests and/or clinical examinations for monitoring diabetes. Efforts to improve diabetes care quality should focus on these populations. These efforts should also include targeted interventions such as integrated treatment programs to improve diabetes care.

Future studies using multistate data should be performed to estimate the rates of adherence to measures of diabetes care

quality over a broader population. Medical records should be used to evaluate the sensitivity of administrative data in assessing healthcare utilization. Measures of glycemic and lipid control (ie, laboratory values) should also be included. Future studies should focus on examining possible factors that contribute to the disparities in diabetes care quality among individuals with diabetes and comorbid SUD, as well as the reasons for differences in adherence among mental health disorder groups.

Author Affiliations: From Center for Health Policy & Research (GYL, JZ, W-CL, REC), University of Massachusetts Medical School, Shrewsbury, MA.

Address correspondence to: Robin E. Clark, PhD, Center for Health Policy & Research, University of Massachusetts Medical School, 333 South Street, Shrewsbury, MA 01545. E-mail: robin.clark@umassmed.edu.

REFERENCES

1. **Druss BG, Rosenheck RA, Desai MM, Perlin JB.** Quality of preventive medical care for patients with mental disorders. *Med Care.* 2002;40(2): 129-136.

2. **Druss BG, Bradford DW, Rosenheck RA, Radford MJ, Krumholz HM.** Mental disorders and use of cardiovascular procedures after myocardial infarction. *JAMA.* 2000;283(4):506-511.

3. **Desai MM, Rosenheck RA, Druss BG, Perlin JB.** Mental disorders and quality of diabetes care in the Veterans Health Administration. *Am J Psychiatry.* 2002;159(9):1584-1590.

4. **Petersen LA, Normand S-T, Druss BG, Rosenheck RA.** Process of care and outcome after acute myocardial infarction for patients with mental illness in the VA health care system: are there disparities? *Health Serv Res.* 2003;38(1 pt 1):41-63.

5. **Redelmeier DA, Tan SH, Booth GL.** The treatment of unrelated disorders in patients with chronic medical diseases. *N Engl J Med.* 1998;338(21):1516-1520.

6. **Druss B, Rosenheck R.** Use of medical services by veterans with mental disorders. *Psychosomatics.* 1997;38(5):451-458.

7. **Druss BG, Rosenheck RA.** Mental disorders and access to medical care in the United States. *Am J Psychiatry.* 1998;155(12):1775-1777.

8. **Jackson JL, Kroenke K.** Difficult patient encounters in the ambulatory clinic: clinical predictors and outcomes. *Arch Intern Med.* 1999;159(10):1069-1075.

9. **Krebs EE, Garrett JM, Konrad TR.** The difficult doctor? Characteristics of physicians who report frustration with patients: an analysis of survey data. *BMC Health Serv Res.* 2006;6:128.

10. **Clark RE, Samnaliev M, McGovern MP.** Treatment for co-occurring mental and substance use disorders in five state Medicaid programs. *Psychiatr Serv.* 2007;58(7):942-948.

11. **Clark RE, Samnaliev M, McGovern MP.** Impact of substance disorders on medical expenditures for medicaid beneficiaries with behavioral health disorders. *Psychiatr Serv.* 2009;60(1):35-42.

12. **Santora PB, Hutton HE.** Longitudinal trends in hospital admissions with co-occurring alcohol/drug diagnoses, 1994-2002. *J Subst Abuse Treat.* 2008;35(1):1-12.

13. **Jones LE, Clarke W, Carney CP.** Receipt of diabetes services by insured adults with and without claims for mental disorders. *Med Care.* 2004;42(12):1167-1175.

14. **Goldberg RW, Kreyenbuhl JA, Medoff DR, et al.** Quality of diabetes care among adults with serious mental illness. *Psychiatr Serv.* 2007; 58(4):536-543.

15. **Frayne SM, Halanych JH, Miller DR, et al.** Disparities in diabetes care: impact of mental illness. *Arch Intern Med.* 2005;165(22): 2631-2638.

16. **National Committee for Quality Assurance.** HEDIS 2008: List of measures. http://www.ncqa.org/Portals/0/HEDISQM/HEDIS2008/ 2008_Measures.pdf. Accessed February 5, 2011.

17. **Kaiser Commission on Medicaid and the Uninsured.** Dual Eligibles: Medicaid's Role for Low-Income Medicare Beneficiaries. http://www.kff. org/medicaid/upload/Dual-Eligibles-Medicaid-s-Role-for-Low-Income-Medicare-Beneficiaries-Feb-2006.pdf. Accessed April 11, 2008.

18. **Adelmann PK.** Mental and substance use disorders among medicaid recipients: prevalence estimates from two national surveys. *Adm Policy Ment Health.* 2003;31(2):111-129.

19. **Kaiser Commission on Medicaid and the Uninsured.** Medicaid and Managed Care: Key Data, Trends, and Issues. February 2010. http:// www.kff.org/medicaid/upload/8046.pdf. Accessed October 21, 2010.

20. **Kaiser Family Foundation.** Medicare Advantage Fact Sheet. September 2010. http://www.kff.org/medicare/upload/2052-14.pdf. Accessed October 21, 2010.

21. **Donaldson MS.** Accountability for quality in managed care. *Jt Comm J Qual Improv.* 1998;24(12):711-725.

22. **Dixon LB, Kreyenbuhl JA, Dickerson FB, et al.** A comparison of type 2 diabetes outcomes among persons with and without severe mental illnesses. *Psychiatr Serv.* 2004;55(8):892-900.

23. **Kreyenbuhl J, Dickerson FB, Medoff DR, et al.** Extent and management of cardiovascular risk factors in patients with type 2 diabetes and serious mental illness. *J Nerv Ment Dis.* 2006;194(6):404-410.

24. **Kronick R, Gilmer T, Dreyfus T, Lee L.** Improving Health-Based Payment for Medicaid Beneficiaries: CDPS. http://cdps.ucsd.edu/cdps_hcfr. pdf. Accessed April 13, 2008.

25. **The Dartmouth Atlas of Health Care.** 2004 ZIP Code Crosswalk. http://www.dartmouthatlas.org/data/download.shtm. Accessed September 22, 2008.

26. **The Dartmouth Atlas of Health Care.** Appendix on the Geography of Health Care in the United States. http://www.dartmouthatlas.org/ downloads/methods/geogappdx.pdf. Accessed February 5, 2011.

27. **Gilmer T, Kronick R, Fishman P, Ganiats TG.** The Medicaid Rx model: pharmacy-based risk adjustment for public programs. *Med Care.* 2001; 39(11):1188-1202.

28. **Regents of the University of California.** University of California, San Diego. Medicaid Rx. http://medicaidrx.ucsd.edu/. Accessed May 9, 2008.

29. **Llorente M, Urrutia V.** Diabetes, psychiatric disorders, and the metabolic effects of antipsychotic medications. *Clin Diabetes.* 2006;24(1): 18-24.

30. **Krosnick A, Wilson MG.** A retrospective chart review of the clinical effects of atypical antipsychotic drugs on glycemic control in institutionalized patients with schizophrenia and comorbid diabetes mellitus. *Clin Ther.* 2005;27(3):320-326.

31. **American Diabetes Association; American Psychiatric Association; American Association of Clinical Endocrinologists; North American Association for the Study of Obesity.** Consensus development conference on antipsychotic drugs and obesity and diabetes. *Diabetes Care.* 2004;27(2):596-601.

32. **Berlin I, Bisserbe JC, Eiber R, et al.** Phobic symptoms, particularly the fear of blood and injury, are associated with poor glycemic control in type I diabetic adults. *Diabetes Care.* 1997;20(2):176-178.

33. **Metsch J, Tillil H, Köbberling J, Sartory G.** On the relation among psychological distress, diabetes-related health behavior, and level of glycosylated hemoglobin in type I diabetes. *Int J Behav Med.* 1995; 2(2):104-117.

34. **Van Tilburg MA, McCaskill CC, Lane JD, et al.** Depressed mood is a factor in glycemic control in type 1 diabetes. *Psychosom Med.* 2001;63(4):551-555.

35. **Ahmed AT, Karter AJ, Liu J.** Alcohol consumption is inversely associated with adherence to diabetes self-care behaviours. *Diabet Med.* 2006;23(7):795-802.

36. **Jackson JL, Kroenke K.** The effect of unmet expectations among adults presenting with physical symptoms. *Ann Intern Med.* 2001; 134(9 pt 2):889-897.

37. **Keating NL, Landrum MB, Landon BE, Ayanian JZ, Borbas C, Guadagnoli E.** Measuring the quality of diabetes care using administrative data: is there bias? *Health Serv Res.* 2003;38(6 pt 1):1529-1545.

38. **Maclean JR, Fick DM, Hoffman WK, King CT, Lough ER, Waller JL.** Comparison of 2 systems for clinical practice profiling in diabetic care: medical records versus claims and administrative data. *Am J Manag Care.* 2002;8(2):175-179. ■