Disparities in Diabetes Care

Impact of Mental Illness

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Background: Emerging evidence indicates that patients with mental health conditions (MHCs) may receive less intensive medical care. Diabetes serves as a useful condition in which to test for MHC-related disparities in care. We examined whether quality measures for diabetes care are worse for patients with or without MHCs.

Methods: This national, cross-sectional study included 313,586 noninstitutionalized Veterans Health Administration patients with diabetes (identified from diagnostic codes and prescriptions) whose Veterans Health Administration facility transmitted laboratory data to a central database; 76,799 (25%) had MHCs (based on diagnostic codes for depressed mood, anxiety, psychosis, manic symptoms, substance use disorders, personality disorders, and other categories). National data from Veterans Health Administration records, Medicare claims, and a national survey were linked to characterize 1999 diabetes care.

Results: Failure to meet diabetes performance measures was more common in patients with MHCs: unadjusted odds ratio (95% confidence interval) was 1.24 (1.22-1.27) for no hemoglobin A1c testing, 1.25 (1.23-1.28) for no low-density lipoprotein cholesterol testing, 1.05 (1.03-1.07) for no eye examination, 1.32 (1.30-1.35) for poor glycemic control, and 1.17 (1.15-1.20) for poor lipemic control. Disparities persisted after case mix adjustment and were more pronounced with specific MHCs (psychotic, manic, substance use, and personality disorders). The percentage not meeting diabetes care standards increased with increasing number of MHCs.

Conclusion: Patients with mental illness merit special attention in national diabetes quality improvement efforts.

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Efforts to optimize the health of people with mental health conditions (MHCs) historically focused on psychotherapeutic and psychopharmacologic interventions. Only recently has the quality of their medical care begun to receive attention. A new field of inquiry has emerged suggesting that patients with MHCs may receive lower-intensity care for a range of medical problems.1,0

Diabetes is an excellent condition in which to examine the effect of MHCs on medical care. The evidence base for diabetes management is strong, leading a partnership of major organizations—including the American Diabetes Association, Centers for Medicare and Medicaid Services, National Committee for Quality Assurance, and Veterans Health Administration (VHA)—to develop accountability measures for diabetes care in 1998 in the Diabetes Quality Improvement Project (DQIP).10 Despite such efforts, variability persists in receipt of recommended care and in attainment of diabetes targets.11-13

One contributor to this variability may be the presence of comorbid MHCs, as others have suggested.6,9,14,15 Mental illness could affect diabetes care at the patient level (eg, communication difficulties,16 access problems,5,17 adherence issues,10 or patient preferences7), provider level (eg, bias against “difficult” patients,19,20 time constraints caused by competing conditions,1,21 or concerns about medication safety8,22), or system level (eg, institutional emphasis on continuity of care23-25). However, previous work examining the association between MHCs and diabetes care has been limited by various issues: not capturing care received outside the health care system under study, representativeness issues, or narrow focus on a single MHC (typically depression) or a single aspect of diabetes care.

To address these gaps in the literature, we linked multiple data sources to examine disparities in diabetes quality measures for a large national cohort of diabetic patients with a spectrum of comorbid MHCs. Specifically, we addressed the following questions: First, are diabetes quality measures worse for patients with...
MHs, even after case mix adjustment? Second, do health care utilization patterns influence associations between MHs and diabetes quality measures? Third, do these associations vary by MHC type? Fourth, does a dose-response effect exist, such that rates of poor diabetes quality measures increase with increasing number of MHs?

METHODS

DATA SOURCES

Our mental health–diabetes (MEND) study database was drawn from the Diabetes Epidemiology Cohort (DEpiC) database.26 For all VHA patients with diabetes since 1998, DEpiC linked patient-level data from multiple sources: (1) VHA’s National Patient Care Database (centralized medical and administrative records for VHA patients nationally); (2) VHA laboratory data from VHA’s Health Care Analysis Information Group; (3) VHA pharmacy data; and (4) Medicare claims. In addition, survey data from the 1999 Large Health Survey of Veteran Enrollees (a mailed survey completed by 887,755 VHA enrollees nationally in January 2000; response rate, 63%)27 was available for a subset of subjects.

STUDY COHORT

The DEpiC study validated the optimal criterion for ascertaining diabetes status in the VHA.26 With this approach, in the MEND study, a patient had diabetes if he or she received an antihyperemic prescription (or glucose monitoring strips) in fiscal year (FY) 1998 and/or had 2 or more codes from the International Classification of Diseases, Ninth Revision (ICD-9) for diabetes (250, 357.2, 362.0, and 366.41) in FY 1997 to 1998 VHA or Medicare outpatient or inpatient data; 419,815 veterans with diabetes were alive on the last day of FY 1999 (based on data from the VHA’s Beneficiary Record Identification and Location files,28,29 supplemented with VHA inpatient and Medicare data by means of a previously developed algorithm30 and used the VHA during FY 1998 (based on outpatient and inpatient files in VHA’s National Patient Care Database). We excluded patients institutionalized for the majority of FY 1999 (0.8%), or whose primary VHA facility did not reliably transmit laboratory data (24.7% of remainder), yielding a final analysis cohort of 313,586. Of note, patient characteristics were generally comparable in patients from the 113 facilities submitting complete laboratory data and the 33 submitting incomplete data. Specifically, 97.8% of patients at facilities submitting complete laboratory data were male, compared with 98.0% at facilities submitting incomplete laboratory data; mean age was 64.82 vs 64.80 years, and mean physical comorbidity index score was 3.5 vs 3.4, respectively. The institutional review boards at Edith Nourse Rogers Memorial Veterans Hospital, Bedford, Mass, and Stanford University, Stanford, Calif, approved this study, and requirement for individual consent was waived.

DEPENDENT VARIABLES

Using the DQIP approach,10 we considered a patient to have “no hemoglobin A1c (HbA1c) test done” if there was no evidence of any HbA1c testing in FY 1999 VHA records (laboratory results files or Current Procedural Terminology [CPT] procedure codes) or Medicare claims (CPT codes). Similarly, a patient had “no low-density lipoprotein cholesterol (LDL-C) test done” if there was no evidence of any LDL-C testing (or total cholesterol, high-density lipoprotein cholesterol, and triglycerides, from which LDL-C could be calculated) in FY 1999 in VHA (laboratory/CPT) or Medicare (CPT). If a patient had no laboratory or CPT records at all (for any test or procedure), we took a conservative approach and assumed that the patient’s laboratory records were incomplete, ie, we counted the laboratory testing measures as missing (rather than as not performed). A patient had “no eye examination done” if no clinical code for ophthalmology or optometry appeared in FY 1999 VHA records and no CPT code for retinal eye examination appeared in Medicare claims (the 1-year ascertainment period reflecting VHA standards). From these 3 process measures, we created a summary measure: a patient had “no monitoring” if he or she had no HbA1c test, no LDL-C test, and no eye examination done.

We used VHA laboratory data to create our 2 intermediate outcome-of-care variables. A patient had “poor glycemic control” if his or her last HbA1c value for FY 1999 was 9.5% or greater, or if no HbA1c test was performed. A patient had “poor lipemic control” if his or her last LDL-C value (actual or calculated31) was 130 mg/dL (3.37 mmol/L) or greater, or if no LDL-C test was performed. These DQIP thresholds represent...
a minimum standard for profiling, not a therapeutic target. Of note, our approach reflected that of the DQIP, which assumes that patients who are not being monitored have poor levels of control; however, in sensitivity analyses (described in a later section), we also examined the effect of limiting outcome analyses to patients who received testing (see Table 1 for detailed variable specifications).

OTHER VARIABLES

We gathered age and sex from VHA records. Race/ethnicity came from VHA records (classified by a third-party observer), supplemented with Medicare records. As a proxy for socioeconomic status, we used mean race- and sex-matched annual household income and mean race- and sex-matched educational attainment for the patient’s ZIP code, from 2000 US Census data. To measure medical comorbidity, we used the physical component of the Comorbidity Index, a count of 36 common, nonpsychiatric medical conditions identified in FY 1998 VHA files; this index was developed for case mix adjustment in VHA outpatient settings. Clinical codes identified FY 1999 utilization of VHA primary care and number of visits to VHA ambulatory care. Survey data indicated whether the patient received all past-year care in the VHA.

Table 1. Operationalization of Process and Outcome Measures From the Diabetes Quality Improvement Project

<table>
<thead>
<tr>
<th>Measure</th>
<th>Study Operationalization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process Measures</strong></td>
<td></td>
</tr>
<tr>
<td>No HbA1c test done Eligible</td>
<td>Subjects whose primary VHA facility submitted adequate laboratory data to central data repository* and with individual-level nonmissing laboratory and/or CPT data† (N = 301 790)</td>
</tr>
<tr>
<td>Numerator criteria</td>
<td>Subjects who did not have either (1) HbA1c laboratory value in VHA or (2) HbA1c CPT code (83036) in VHA or Medicare in FY 1999</td>
</tr>
<tr>
<td>No LDL-C test done Eligible</td>
<td>Subjects whose primary VHA facility submitted adequate laboratory data to central data repository* and with individual-level nonmissing laboratory and/or CPT data† (N = 287 763)</td>
</tr>
<tr>
<td>Numerator criteria</td>
<td>Subjects who did not have either (1) LDL-C laboratory value (actual or calculated) in VHA or (2) LDL-C CPT code (80061, 83721, 83715, 83716, or [83718 and 84478]) in VHA or Medicare in FY 1999</td>
</tr>
<tr>
<td>No eye examination done Eligible</td>
<td>Subjects with VHA clinic code data (N = 313 589)</td>
</tr>
<tr>
<td>Numerator criteria</td>
<td>Subjects who did not have either an ophthalmology or optometry visit in VHA or an ophthalmology CPT code (90202, 92004, 92012, 92014, 92018, 92019, 92225, 92226, 92235, or 92250) in Medicare in FY 1999</td>
</tr>
<tr>
<td>No monitoring Eligible</td>
<td>Subjects without missing data for any of the 3 process measures (N = 286 922)</td>
</tr>
<tr>
<td>Numerator criteria</td>
<td>Subjects who had no HbA1c test done, no LDL-C test done, and no eye examination done</td>
</tr>
<tr>
<td><strong>Outcome Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Poor glycemic control Eligible</td>
<td>Subjects whose primary VHA facility submitted adequate laboratory data* and with individual-level nonmissing laboratory data‡ (N = 263 966)</td>
</tr>
<tr>
<td>Numerator criteria</td>
<td>Subjects who had either (1) HbA1c value ≥9.5% in FY 1999 or (2) no HbA1c test done, as defined above</td>
</tr>
<tr>
<td>Poor lipemic control Eligible</td>
<td>Subjects whose primary VHA facility submitted adequate laboratory data* and with individual-level nonmissing laboratory data‡ (N = 253 007)</td>
</tr>
<tr>
<td>Numerator criteria</td>
<td>Subjects who had either (1) LDL-C value ≥130 mg/dL (≥3.37 mmol/L) in FY 1999 or (2) no LDL-C test done as defined above</td>
</tr>
</tbody>
</table>

Abbreviations: CPT, Current Procedural Terminology 4 procedure codes; FY, fiscal year; HbA1c, hemoglobin A1c; LDL-C, low-density lipoprotein cholesterol; VHA, Veterans Health Administration.
*Not all facilities submitted complete laboratory data to the Healthcare Analysis and Information Group.
†Subject was counted as missing if VA laboratory data and VA CPT data were not available for the subject.
‡Subject was counted as missing if VA laboratory data were not available for the subject.

STUDY MEASUREMENTS

We compared patients with MHCs with those without MHCs for our 6 diabetes care measures, first in bivariate analyses (using χ2 or unpaired 2-tailed t testing for statistical significance) and then in logistic regression analyses, using the SAS statistical package (SAS version 8.0; SAS Institute Inc, Cary, NC). We first calculated unadjusted odds ratios using logistic regression, because the DQIP perspective is that its accountability measures represent thresholds that should be attained independent of case mix.13 We then repeated logistic regression analyses, adjusting for potential patient-level confounders: age, sex, race/ethnicity, income, education, and physical comorbidity index. Next, we examined the potential impact of health care utilization patterns. We repeated adjusted analyses in the subset of patients with 3 or more FY 1999 VHA primary care visits (ie, regular users of VHA primary care). We also repeated adjusted logistic regression analyses in the full cohort, additionally accounting for number of primary care visits in FY 1999.

Mental health conditions** represents a heterogeneous set of conditions. Therefore, we next repeated our unadjusted and adjusted logistic regression analyses, comparing (sequentially) patients with each of the 10 MHC categories with those with no MHC.

Finally, we tested for a possible “dose-response” effect. Specifically, we examined rates of undesirable diabetes care measures as a function of count of the patient’s MHC diagnosis categories.

SENSITIVITY ANALYSES

We tested the effect of varying assumptions on study findings. First, we recalculated case mix–adjusted odds ratios for the 6 diabetes care measures as a function of MHCs in hierarchical linear models accounting for potential clustering at the level
of the patient’s primary facility. Second, we repeated our adjusted logistic regression analyses, replacing the “any MHC” variable with our “high-specificity” definition and then (in the subgroup who completed the survey) with our “high-sensitivity” definition. Third, we tested the effect of deleting from the denominator those patients who had no HbA1c test performed, reexamining in this subset the association between poor glycemic control and MHCs in unadjusted and adjusted analyses (and similarly for lipemic control). Fourth, for intermediate outcomes measures, we examined clinically relevant HbA1c and LDL-C thresholds lower than the DQIP threshold.

OLD. Fifth, a substantial number of VHA patients split their care between VHA and non-VHA settings, raising the possibility that VHA records may not capture all care received in a given year. Therefore, we examined diabetes care measures as a function of MHCs in the subset self-reporting that they received all past-year care in the VHA. Sixth, since patients with MHCs tend to be younger (and therefore less likely to have access to Medicare), we repeated diabetes care measures as a function of MHCs in those 65 years and older.

### RESULTS

#### PATIENT CHARACTERISTICS

Among the 313,586 diabetic patients in our national cohort, 24.5% had “any MHC” (global indicator); 15.5% had a depressive disorder; 12.0%, anxiety; 5.3%, psychosis; 2.6%, manic symptoms; 5.8%, substance use disorder; 1.7%, personality disorder; and less than 1%, other categories. Despite the younger age of patients with MHCs, their physical health status was worse and they used VHA outpatient health care services more heavily. Patients with MHCs were also more likely to rely on the VHA as their exclusive source of care (Table 2).

#### MAIN ANALYSES

Table 3 summarizes MHC-related disparities in diabetes care measures. Patients with MHCs had worse diabetes measures in every dimension examined, both in unadjusted analyses and after case mix adjustment. In case mix-adjusted models, other variables associated with worse diabetes measures were age younger than 55 years, black race (compared with white), and other race (compared with white); female sex had a smaller and less consistent adverse effect on diabetes measures (data not shown).

**HEALTH CARE UTILIZATION EFFECTS**

As Table 3 shows, disparities persisted for every diabetes measure among patients receiving regular primary care.
In the full cohort, additionally adjusting the case mix–adjusted models for number of VHA primary care visits did not alter this effect.

EFFECT OF MHC TYPE

Disparities in diabetes measures varied substantially by MHC type (Figure 1). Across all measures, effect sizes for psychosis, manic symptoms, substance use, and personality disorders were larger than those for depression and anxiety.

DOSE-RESPONSE EFFECT

Figure 2 demonstrates a dose-response effect, with the percentage of patients having poor diabetes measures increasing as number of MHCs increases from 0 to 6. This effect is seen for every diabetes measure studied.

SENSITIVITY ANALYSES

In sensitivity analyses (data not shown), we first recalculated the adjusted odds ratios from Table 3 in hierarchical linear models, accounting for potential facility-level clustering. This had virtually no effect on adjusted odds ratios; disparities persisted. Second, we repeated the adjusted odds ratios from Table 3, substituting the high-sensitivity MHC (15.4% of our cohort) and then the high-specificity MHC (33.5% of our cohort) definitions for the any-MHC definition. Findings were comparable. Third, we examined the effect of MHCs on glycemic and lipemic control in the subset of patients for whom laboratory values were available (ie, excluding patients who did not have laboratory monitoring performed). Disparities persisted but were smaller, indicating that part of the disparities in our intermediate outcome measures derived from failure to receive monitoring. Fourth, we varied HbA₁c and LDL-C thresholds: disparities persisted (but were smaller) at HbA₁c thresholds of 9.0% and 8.0%, and at an LDL-C threshold of 100 mg/dL (2.59 mmol/L); at an HbA₁c threshold of 7.0%, the adjusted odds ratio fell below 1.0. Fifth, we examined main effects in the subset of patients who participated in the national survey and who self-reported that they received all FY 1999 care in the VHA (ie, for whom all care could be captured with VHA records, n=51,525). Again, our findings were unchanged, except that the eye examination effect reported in Table 3 became nonsignificant. Sixth, in the subset of patients 65 years or older, findings were again unchanged.
We documented disparities in every measured element of diabetes care for patients with mental illness. Findings were robust in unadjusted and adjusted analyses among the full cohort, those receiving VHA primary care, those using the VHA as their exclusive source of care (for whom all care could be reliably captured), and those 65 years or older. Adjusting for number of primary care visits did not alter this effect. Varying the definition of MHCs or accounting for potential institution-level clustering likewise did not affect results. Disparities increased progressively with increasing number of comorbid MHCs, suggesting a dose-response effect. Disparities were most pronounced for specific MHCs: psychosis, manic symptoms, substance use, and personality disorders.

The recent Institute of Medicine report, Unequal Treatment: Confronting Racial and Ethnic Disparities in Healthcare, synthesizes current knowledge about major sources of race-related health care disparities, citing patient-provider interactions as a major factor; mental illness–related disparities have received far less attention. Since patient-provider interactions may suffer in the setting of MHCs, there is a pressing need to investigate the scope of MHC-related disparities. Our work represents, to our knowledge, the largest-scale, most systematic evaluation to date of mental illness–related disparities in medical care provided for a major medical condition, diabetes.

Our findings are consistent with those of 2 other recent studies (one in regular users of VHA primary care, the other in an Iowa managed care setting). These studies document process of care disparities, and resonate with other work indicating that patients with MHCs receive less intensive services as diverse as arthritis treatment, post–myocardial infarction care, preventive health care, and pain management. Our findings about disparities in intermediate outcomes of care are likewise consistent with most earlier studies, although most have focused on glycemic control and depression.

Our study extends this line of inquiry in several ways. We examined both process and outcomes of care in a broad spectrum of MHCs rather than a single condition. Unlike several previous studies using a wide ICD-9 code range to identify patients with MHCs, we refined an approach to the identification of patients with MHCs, conducting sensitivity analyses to test the effect of varying our assumptions. Our study addresses the important issue of non-VHA utilization, both by accounting for Medicare utilization and by examining disparities in patients using the VHA as their exclusive source of care. Finally, our study population was large and geographically diverse. We applied few exclusion criteria, to maximize its representativeness.

Mechanisms underlying MHC-related disparities remain elusive. They could reflect patient-level, provider-level, or system-level factors. While not designed to examine mechanisms, our study does supply clues. The exaggerated effects seen in patients with substance use disorders, consistent with earlier work, could reflect in part the fact that they (unlike patients with other MHCs) often underuse preventive medical services. Since clinicians tend to pay more attention to “likable” patients, our finding of more pronounced disparities in patients diagnosed as having personality disorder raises the possibility that interpersonal aspects of the patient-provider relationship could additionally contribute. The observation that disparities were more pronounced for poor glycemic control (HbA1c threshold, 9.5%) than for better control (eg, HbA1c threshold, 8.0%) suggests that there may be subsets of patients with MHCs at particularly high risk (and others who do well). Finally, our finding that disparities are not affected by adjusting for number of primary care visits suggests that frequent contact with the primary care system does not overcome whatever barriers are preventing patients with MHCs from achieving desired diabetes care measures.

Several caveats deserve mention. First, we used ICD-9 codes to identify MHCs. While this is a common approach in mental health services research, it underdetects MHCs because of underdiagnosis or underdocumentation. Therefore, our no-MHC group undoubtedly included some MHC cases, making the 2 groups more similar and diluting the strength of observed effects. However, the stability of findings using high-specificity and high-sensitivity definitions is reassuring. Second, while we adjusted for known confounders (eg, sex and medical comorbidity), we cannot exclude the possibility of unmeasured confounders explaining differences of this magnitude. Third are issues related to data capture. Only patients whose primary VHA facility was one of the 78% submitting complete laboratory data to central VHA files were included. This is unlikely to have introduced important bias, since diabetic patients at included facilities resembled diabetic patients at excluded facilities on demographic characteristics. Although our focus was on differences in diabetes measures for patients with vs without MHCs (rather than absolute rates), it is reassuring that the overall rate of adherence that we observed was in line with rates observed in contemporaneous VHA and non-VHA studies. For example, in our study, lack of HbA1c testing, lack of lipid testing, and lack of eye examination were seen in 17%, 30%, and 41% of VHA diabetic patients, respectively, in 1999. In the same year, rates were 7%, 27%, and 33%, respectively, in one VHA study and 6%, 29%, and 27%, respectively, in another VHA study. (The somewhat better rates of testing in those studies compared with ours likely reflect the fact that their samples included regular users of primary care; because of concerns that patients with MHCs might access primary care differently, we included patients who were not enrolled in primary care so as to avoid selection bias.) In a national study where medical records were abstracted for Medicare patients nationally in 1998 to 1999, the corresponding rates were 30%, 26%, and 32%, respectively. Finally, the VHA health care system emphasizes care of patients with MHCs. It is likely that disparities may be larger in systems with less integrated medical and mental health care. To test generalizability, it will be important to replicate our findings in diverse clinical settings.

Our findings have several important implications. First, the recent campaign to identify and treat psychiatric illness in the primary care setting is necessary but not...
sufficient: attention to medical problems in patients with MHCs is also critical. Second, additional research is needed to identify what patient-level, provider-level, and systemic-level factors drive these effects. Such work could point to promising interventions. Third, our work advances a growing body of evidence suggesting that patients with MHCs may receive lower-intensity care for a number of medical conditions. The consistency of this effect across diverse medical conditions suggests there remain fundamental challenges in the medical care of patients with MHCs, rather than an idiosyncratic interaction between MHCs and particular conditions. Mental health conditions affect 20% to 30% of the US population, and diabetes is but one of many medical comorbidities. Thus, from a public health perspective, the aggregate effect of MHCs on medical care could be substantial, potentially even contributing to the excess mortality associated with MHCs. Paradigm shifts, such as delivery systems integrating medical and mental health services, may prove necessary to optimize the medical care of patients with mental illness.

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