The Journal of Mental Health Policy and Economics
J Ment Health Policy Econ **6**, 113-121 (2003)

Benchmarking the Quality of Schizophrenia Pharmacotherapy: A Comparison of the Department of Veterans Affairs and the Private Sector

Douglas L. Leslie,[1]* and Robert A. Rosenheck[2]

[1]*Ph.D., Departments of Psychiatry and Public Health, Yale School of Medicine, VA Connecticut Mental Illness Research, Education and Clinical Center Northeast Program Evaluation Center, West Haven VAMC, West Haven, CT, USA*
[2]*MD, Departments of Psychiatry and Public Health, Yale School of Medicine, VA Connecticut Mental Illness Research, Education and Clinical Center Northeast Program Evaluation Center, West Haven VAMC, West Haven, CT, USA*

Abstract

Background: Comparing quality of care between large health care systems is important for health systems management. This study used measures of the quality of pharmacotherapy for patients with schizophrenia and compared these measures across a sample of patients from the Department of Veterans Affairs (VA) and the private sector.

Methods: A random sample of all patients diagnosed with schizophrenia in the VA during fiscal year (FY) 2000 was identified using administrative data. In the private sector, a sample of patients diagnosed with schizophrenia in 2000 was identified using MEDSTAT's MarketScan® database. For both groups, use of antipsychotic medications was studied and measures of the quality of pharmacotherapy were constructed, including whether patients were prescribed any antipsychotic medication, one of the newer atypical antipsychotics, and whether dosing adhered to established treatment recommendations. These measures were compared across the two groups using logistic regression models, controlling for age, gender, and comorbid diagnoses.

Results: Most patients with a diagnosis of schizophrenia (82% in the VA and 73% in the private sector) received an antipsychotic medication, usually one of the newer atypical drugs. Patients in the VA were more likely to be dosed above treatment recommendations, and less likely to be dosed below treatment recommendations. Overall, differences in proportion schizophrenia patients dosed according to recommendations were not statistically different across the two systems (60% in the VA, 58% in the private sector).

Conclusions: Differences between the two systems were mixed, with the VA outperforming the private sector with respect to some measures and doing worse on others.

Implications for Health Care Provision: Although the VA and the private sector were comparable with respect to the quality measures used in this study, there is room for improvement in both systems. Treatment recommendations are based on the best available clinical evidence of effectiveness and safety. Quality of care might be improved with better adherence to these recommendations.

Implications for Health Policies: Relatively low rates of adherence to treatment recommendations may be due to lack of awareness of these recommendations among prescribing physicians, or a belief that the recommendations are inadequate. To the extent that low rates of adherence to treatment recommendations are caused by a lack of awareness among physicians, policies should be developed to disseminate this information and encourage the appropriate use of these medications.

Implications for Further Research: Further research is needed to understand physician prescribing decisions for these medications. To the extent that physicians feel treatment recommendations for these drugs are inadequate, further research is needed to refine the recommendations.

Received 21 January 2003; accepted 22 September 2003

Introduction

As pressure mounts to reduce the costs of health care, there is increasing emphasis on measuring and preserving the quality of care delivered. For patients with schizophrenia, the most debilitating of mental illnesses, pharmacotherapy has long been a cornerstone of effective treatment. The schizophrenia Patient Outcomes Research Team (PORT) has developed a set of widely respected recommendations for the appropriate treatment of patients with schizophrenia, which include, among other things, dosing recommendations for antipsychotic medications. However, few studies have used these recommendations as a basis for evaluating the quality of care delivered within a health care system.[1-5] Although the Health Plan Employer and Information Set (HEDIS) has become the standard tool for comparing the quality of health plans, it

* **Correspondence to:** Douglas L. Leslie, Ph.D., Departments of Psychiatry and Public Health, Yale School of Medicine, NEPEC 182, 950 Campbell Ave., West Haven, CT 06516, USA
Tel.: +1-203-932 5711 x 4015
Fax: +1-203-937 3433
E-mail: douglas.leslie@yale.edu
Source of Funding: This work was partially supported by the Department of Veterans Affairs New England Mental Illness Research, Education and Clinical Center; and through a contract with AstraZeneca Corporation.

contains very few measures of the quality of mental health services, and does not address the quality of pharmacotherapy.[6-8]

An important component of quality evaluation and management is the ability to compare quality measures across health care systems. It is difficult to determine whether a particular measure is ''too low'' or ''too high'' unless it can be placed in the context of other systems' performance on the measure. Although comparing quality across health care systems can be difficult because the populations served can be very different,[9] this may be less of a problem in comparing pharmacotherapy quality measures. If one system treats more severely ill patients, one might expect readmission rates or lengths of stay to be higher in that system than in other systems, but one might not necessarily expect rates of adherence to dosing recommendations to be different.

This paper benchmarks the quality of schizophrenia pharmacotherapy in the Department of Veterans Affairs (VA). The goals of this study were to build on measures of the quality of pharmacotherapeutic care for schizophrenia that were developed elsewhere[2-4,10,11] and to use these measures to compare the quality of care in the Department of Veterans Affairs and a sample of privately insured individuals for 2000. Specifically, the goals of the study were as follows: (i) to determine the extent to which the treatment of patients diagnosed with schizophrenia adhered to PORT recommendations, (ii) to determine the extent to which patients diagnosed with schizophrenia were prescribed multiple antipsychotic medications (polypharmacy), (iii) to determine the extent to which patients diagnosed with schizophrenia received one of the newer atypical antipsychotic medications, and (iv) to investigate whether there were significant differences between the two systems on these measures. Although polypharmacy is not addressed in the PORT recommendations, it is generally discouraged among patients with schizophrenia since multiple antipsychotic medications are likely only to exacerbate side effects without further alleviating symptoms.[12-15]

Methods

Sources of Data

VA data for this study came from national VA administrative databases. We first identified all VA outpatients diagnosed with schizophrenia during fiscal year (FY) 2000 (October 1, 1999 to September 30, 2000) using the outpatient encounter file, a national database concerning all outpatient clinic visits in the VA. Patients were identified as being diagnosed with schizophrenia if they had at least two outpatient encounters in a specialty mental health outpatient clinic with a primary or secondary diagnosis of schizophrenia (International Classification of Diseases, 9th revision (ICD-9) codes 295.00 – 295.99) during the year. Next, all outpatient prescription drug records for these patients during FY 2000 were collected from the Drug Benefit Management System in Hines, Illinois. Because nurses dispense depot medications on site in their clinics without specific prescriptions, we did not have patient-level information for depot drugs. Hence, only prescriptions for oral medications were included in the dataset. Because patients could receive medications outside of the VA system, our final sample included only patients who received at least one prescription (psychotropic or otherwise) from a VA pharmacy. Finally, data on patient age and gender were collected from the outpatient care file, which contains information about each day of outpatient care in VA.

Data pertaining to the private sector came from MEDSTAT's MarketScan® database, which contains claims information for a national sample of over 2.6 million covered lives in 2000. The claims data cover employees and retirees of approximately 45 large corporations, and their dependents. These claims data are collected from over 100 different insurance plans, including Blue Cross and Blue Shield plans and third party administrators. The private sector sample was constructed in the same manner as the VA sample: patients with 2 or more outpatient visits with a diagnosis of schizophrenia were identified. The sample was limited to patients with corresponding prescription pharmacy information.

Because the number of patients in the VA sample (N = 103,027) was so much larger than the number of patients in the private sector sample (N = 1,318), a random sample of the VA cohort was taken so that there was a two-to-one VA-to-private sector ratio. We randomly sampled VA patients so that the statistical tests of the differences between the two systems would be more meaningful.

Measures

For each patient, the last prescription for an antipsychotic medication during the year was identified as the index prescription. All prescriptions for antipsychotic medications filled (both new prescriptions and refills) during the week prior to the index prescription were then identified. Because it is possible for prescriptions for concurrent medications to be filled on different days, we examine prescriptions over a one-week window in order to identify all medications that a patient is taking. Since schizophrenia is a chronic disease and patients in our sample had multiple prescriptions for antipsychotic medications throughout the year, we arbitrarily chose the last prescription of the year in order to take a ''snapshot'' of the antipsychotic regimen.

There are two broad classes of antipsychotic medications: conventional and atypical. Atypical antipsychotics are at least as effective as the conventional medications and have substantially fewer side effects. Because they work in different ways, we used different methods to determine whether dosages complied with PORT dosing recommendations. For the conventional antipsychotics, we calculated chlorpromazine (CPZ) equivalents for each prescription based on the updated PORT dosing algorithms (A. Lehmann, personal communication). CPZ equivalents were summed over all conventional antipsychotic prescriptions during the week to assess adherence to treatment recommendations. The PORT dosing

recommendations have two ranges: one for maintenance therapy and one for acute therapy. To be conservative, we used the range for acute therapy because it is wider. If the total daily CPZ equivalent for all conventional antipsychotics prescribed during the week was outside of the PORT recommended range (300 mg to 1,000 mg), the patient was identified as being dosed too low or too high. For the atypical antipsychotics, the total daily dosage for each medication prescribed during the week was calculated. If the total dosage of any atypical was outside of the PORT recommended range, the patient was identified as being dosed too low or too high. The PORT recommended dose for atypical antipsychotic medications are as follows: clozapine 150-600 mg/day, olanzapine 5-20 mg/day, quetiapine 150-750 mg/day and risperidone 2-6 mg/day. In addition, a patient was also identified as being dosed too high if they were prescribed the maximum PORT recommended dose of one atypical *and* were also prescribed any amount of a second atypical.

Patients who were prescribed more than one antipsychotic medication during the week were identified as receiving polypharmacy. In addition, the subgroup of patients whose polypharmacy consisted of receiving both an atypical and a conventional antipsychotic medication was identified.

Data Analytic Procedures

Data analysis proceeded in several steps. First, the proportion of patients with the following characteristics were determined: (i) those who received any antipsychotic medications, (ii) those whose dosage was in compliance with PORT recommendations, (iii) those who were dosed above the PORT recommended dose, (iv) those who were dosed below the PORT recommendations, (v) those who received multiple antipsychotic medications, (vi) those who received any atypical antipsychotic medication, and (vii-x) those who received each of the atypical medications (clozapine, olanzapine, quetiapine and risperidone) that were available during 2000. Chi-square tests were performed to determine whether differences in these measures between the VA and the private sector were statistically significant.

Next, we used logistic regression analysis to determine the effects of service system and patient characteristics on the quality measures described above. Each regression model included patient age, gender, and whether the patient was treated in the VA. Dichotomous variables were also included describing whether the patient had another primary or secondary diagnosis of mental illness in addition to a diagnosis of schizophrenia during 2000. Patients with other comorbid mental health diagnoses may be more severely ill and difficult to treat, which could affect choice of pharmacotherapy. Diagnoses were based on ICD-9 diagnostic codes and included the following: psychosis other than schizophrenia, dementia or Alzheimer's disease, major depression, bipolar disorder, post-traumatic stress disorder (PTSD), substance abuse, anxiety disorder, adjustment reaction, personality disorder, dysthymia, and other mental health disorders. ICD-9 diagnostic codes corresponding to these disorders are reported in the Appendix.

Results

Table 1 shows some characteristics of the study sample. The VA sample was overwhelmingly male (94.8%), which is characteristic of the VA population. The private sector was more evenly divided across gender (55.0% female). The VA sample was also significantly older than the private sector patients (52.9 years versus 45.0 years). Rates of comorbidity generally were not statistically significant, with the exception of dementia (6.7% in the VA versus 4.2% in the private sector, $p = 0.0016$), PTSD (13.8% versus 1.6%, $p < 0.0001$), substance abuse (23.7% versus 5.1%, $p < 0.0001$), and personality disorder (7.4% versus 3.0%, $p < 0.0001$).

The lower portion of **Table 1** shows the schizophrenia pharmacotherapy quality measures for the two systems. More patients in the VA received an antipsychotic medication compared to the private sector (82.3% versus 72.6%, $p < 0.0001$). Although it was more common for patients to get an atypical drug than a conventional medication in both systems (65.4% got atypicals in the VA and 74.1% got atypicals in the private sector), patients in the private sector were significantly more likely to receive one of the newer class of medications ($p < 0.0001$), especially clozapine and quetiapine. While there were no statistically significant differences in the proportion of patients whose dose adhered to PORT recommendations, VA patients were significantly more likely to be dosed above PORT recommendations (13.0% versus 9.7%, $p = 0.01$) and significantly less likely to be dosed below the PORT recommended range (27.8% versus 33.4%, $p = 0.001$). In both systems, compliance with PORT dosing recommendations was better for patients prescribed an atypical medication than for patients receiving conventional drugs. Finally, rates of polypharmacy were low in both systems and were not significantly different (7.7% in the VA and 6.5% in the private sector, $p = 0.25$). The majority of polypharmacy in both systems consisted of a conventional and an atypical medication.

Table 2 shows the logistic regression results for the measures. The results for each model are presented with estimated coefficients, *p*-values, and odds ratios for each independent variable. For the first model, which predicts whether patients received any antipsychotic medication, the sample included all patients in the study group. For the other models, the sample was limited to those patients who received an antipsychotic medication.

Even after controlling for other patient characteristics, VA patients were still more likely to receive an antipsychotic medication, yet less likely to receive an atypical drug. In addition, VA patients were significantly more likely to be dosed above PORT dosing recommendations ($p = 0.006$) and significantly less likely to be dosed below PORT recommendations ($p = 0.0006$) than private sector patients. The effect of service system on the likelihood of polypharmacy was not statistically significant.

The effect of age was statistically significant across all of the models, with older patients being less likely to receive an antipsychotic ($p = 0.0004$), less likely to receive an atypical ($p < 0.0001$), less likely to be dosed above PORT

Table 1. Sample Characteristics

Variable	VA Sample N	%	Mean	Std Dev	Private Sample N	%	Mean	Std Dev	χ^2 or t statistic	p
Age	2.636		52,86	12,24	1.318		45,05	12,71	-18,68	<.0001
Female	136	5.2%			725	55.0%			1.281,78	<.0001
Comorbid diagnoses *										
Other psychosis	333	12.6%			176	13.4%			0,41	0,52
Dementia/Alzheimer's disease	176	6.7%			55	4.2%			10,01	0,002
Major depression	505	19.2%			257	19.5%			0,07	0,80
Bipolar disorder	420	15.9%			215	16.3%			0,09	0,76
PTSD	364	13.8%			21	1.6%			149,18	<.0001
Substance abuse	624	23.7%			67	5.1%			210,53	<.0001
Adjustment reaction	138	5.2%			44	3.3%			7,20	0,007
Anxiety disorder	313	11.9%			153	11.6%			0,06	0,81
Personality disorder	196	7.4%			39	3.0%			31,50	<.0001
Dysthymia	467	17.7%			220	16.7%			0,64	0,42
Other psychiatric diagnosis	196	7.44%			77	5.8%			3,47	0,06
Received any antipsychotic *	2.170	82.3%			957	72.6%			50,10	<.0001
Received a conventional drug	868	40.0%			290	30,3%			26,78	<.0001
Received an atypical drug	1.420	65.4%			709	74,1%			22,86	<.0001
Received any clozapine	50	3.5%			80	11,3%			61,11	<.0001
Received any olanzapine	701	49.4%			277	39,1%			3,49	0,06
Received any quetiapine	119	8.4%			99	14,0%			24,20	<.0001
Received any risperidone	583	41.1%			269	37,9%			0,52	0,47
Comply with PORT dosing guidelines *	1.296	59.7%			551	57.6%			1,27	0,26
on a conventional drug	334	38.5%			71	24,5%			18,72	<.0001
on an atypical drug	1.063	74.9%			511	72.1%			1,90	0,17
Dosed above PORT guidelines	281	13.0%			93	9.7%			6,59	0,010
on a conventional drug	81	9.3%			10	3.4%			10,39	0,001
on an atypical drug	204	14.4%			86	12.1%			2,01	0,16
Dosed below PORT guidelines	603	27.8%			320	33.4%			10,19	0,001
on a conventional drug	453	52.2%			209	72.1%			35,08	<.0001
on an atypical drug	153	10.8%			112	15.8%			10,95	0,001
Prescribed polypharmacy	166	7.7%			62	6.5%			1,35	0,25
both an atypical and a conventional	118	71.1%			42	67.7%			0,04	0,84

* Percentages within category sum to more than 100% because patients could be in multiple categories simultaneously.

Table 2. Logistic Regression Results

Independent Variable	Received any antipsychotic			Received any atypical antipsychotic [a]			Dosed above PORT recommendation [a]			Dosed below PORT recommendation [a]			Prescribed polypharmacy [a]		
	Coefficient	p	Odds ratio	Coefficient	p	Odds ratio	Coefficient	p	Odds ratio	Coefficient	p	Odds ratio	Coefficient	p	Odds ratio
VA patient	0,84	**<.0001**	2,32	-0,37	**0,001**	0,69	0,44	**0,01**	1,55	-0,39	**0,0006**	0,68	0,20	0,31	1,22
Age	-0,01	**0,0004**	0,99	-0,02	**<.0001**	0,98	-0,03	**<.0001**	0,97	0,03	**<.0001**	1,03	-0,02	**0,004**	0,98
Female	0,21	0,07	1,23	-0,05	0,66	0,95	-0,28	0,12	0,76	0,21	0,08	1,24	-0,26	0,25	0,77
Other psychosis	0,60	**<.0001**	1,82	0,49	**0,0003**	1,63	-0,15	0,41	0,86	-0,13	0,30	0,88	0,40	**0,04**	1,49
Dementia/Alzheimer's disease	-0,13	0,45	0,88	0,43	**0,03**	1,54	-0,29	0,33	0,75	0,15	0,37	1,17	-0,16	0,63	0,85
Major depression	-0,47	**<.0001**	0,63	0,38	**0,002**	1,46	-0,18	0,30	0,84	0,13	0,26	1,14	-0,10	0,64	0,91
Bipolar disorder	0,07	0,51	1,08	0,47	**0,0001**	1,59	-0,09	0,57	0,91	-0,15	0,18	0,86	0,11	0,56	1,12
PTSD	-0,09	0,51	0,91	0,19	0,21	1,21	-0,34	0,12	0,71	0,15	0,31	1,16	-0,44	0,14	0,65
Substance abuse	-0,07	0,58	0,94	0,15	0,21	1,16	-0,20	0,20	0,82	0,03	0,82	1,03	-0,02	0,93	0,98
Adjustment reaction	-0,81	**<.0001**	0,45	0,31	0,21	1,37	-0,32	0,37	0,72	0,06	0,80	1,06	0,31	0,40	1,36
Anxiety disorder	-0,21	0,09	0,81	0,36	**0,02**	1,43	-0,38	0,09	0,69	-0,06	0,66	0,94	-0,35	0,21	0,71
Personality disorder	-0,08	0,63	0,92	0,08	0,66	1,09	0,37	0,11	1,45	0,21	0,24	1,23	0,09	0,78	1,09
Dysthymia	-0,32	**0,003**	0,73	0,13	0,31	1,14	-0,21	0,25	0,81	-0,10	0,41	0,90	-0,62	**0,01**	0,54
Other psychiatric diagnosis	-0,01	0,93	0,99	0,14	0,44	1,15	0,12	0,60	1,13	0,03	0,84	1,03	-0,43	0,21	0,65

[a] Among patients with schizophrenia who receive an antipsychotic.

recommendations ($p < 0.0001$), more likely to be dosed below PORT recommendations ($p < 0.0001$), and less likely to receive polypharmacy ($p = 0.004$). The effect of patient gender was not statistically significant in any of the models. The presence of comorbid conditions was not statistically significant in the models predicting deviation from PORT dosing recommendations, and there were few consistent patterns across the other models with respect to comorbid conditions. Patients with other psychoses were more likely to be prescribed an antipsychotic (OR = 1.82, $p < 0.0001$), more likely to receive an atypical (OR = 1.63, $p = 0.0003$), and more likely to be prescribed polypharmacy (OR = 1.49, $p = 0.04$). Patients with major depression were less likely to be prescribed an antipsychotic (OR = 0.63, $p < 0.0001$), but more likely to receive an atypical (OR = 1.46, $p = 0.002$).

To explore further differences in the likelihood that patients received atypical medications, we ran separate logistic regression models for each of the atypical antipsychotic agents. The results are reported in **Table 3**. VA patients were significantly less likely to receive clozapine and quetiapine than patients in the private sector (OR = 0.32 and OR = 0.52, respectively), although the number of patients receiving these medications was small in both service systems.

It is notable that while clozapine, olanzapine and quetiapine were less likely to be used for older patients, there was no age effect for risperidone. In addition, quetiapine was more likely to be used in patients with three specific comorbidities: dementia/Alzheimer's disease, bipolar disorder and PTSD; while risperidone was more likely to be used in other psychoses and anxiety disorders. The presence of comorbid conditions did not affect the likelihood that a patient received clozapine or olanzapine.

Discussion

This study compared the quality of pharmacotherapy for schizophrenia in the Department of Veterans Affairs and in a sample of privately insured individuals. We found that VA patients were more likely to receive an antipsychotic medication and were equally likely to be dosed according to PORT recommendations. When patients were dosed outside of PORT recommendations, VA patients were more likely to be dosed above the recommended level and less likely to be dosed below the recommendations. Other patient characteristics that significantly affected some of the quality measures included age, and having a comorbid diagnosis of other psychosis, dementia/Alzheimer's disease, major depression, bipolar disorder, adjustment reaction or dysthymia.

While Lehman and colleagues[10] compared the quality of schizophrenia pharmacotherapy to established treatment recommendations, they recognized that actual practice may differ from treatment guidelines under special clinical circumstances. Hence, an important component of quality evaluation is to be able to benchmark quality measures across systems of care. This is the first study that we are aware of to assess the quality of pharmacotherapy in this way.

The results presented are consistent with findings from earlier studies. Rates of adherence to schizophrenia PORT dosing recommendations in the VA sample are similar to those from other studies.[4,5,10,16] Very few studies have examined measures similar to those presented here among privately insured patients with schizophrenia. While some have looked at rates of use of atypicals and polypharmacy[17] and others have looked at dosing above the PORT recommendations,[18] there are no studies looking at a broad range of quality measures as presented here. There are also very few studies comparing quality measures across health care delivery systems. A previous study by Leslie and Rosenheck[9] found that differences between VA and the private sector in quality of inpatient and outpatient care for patients with mental illness were modest, and were likely due to the fact that VA patients are generally more severely ill than patients in the private sector. Our results are somewhat different from this earlier study in that there were no differences in overall quality. Pharmacotherapy appears to be less affected by differences in patient characteristics across service systems than measures of quality based on patterns of service use.

Given that antipsychotics are the cornerstone of effective treatment for schizophrenia,[19] it was unexpected that the proportions of patients with a diagnosis of schizophrenia who received no antipsychotic medication were so high. Some of these patients may have received depot medications, which are not included in our databases, and others may have filled prescriptions outside of the VA or their health plan. Further studies are needed to determine how these patients are treated.

Older patients were significantly less likely to receive an antipsychotic, and when they did, were less likely to receive an atypical drug. One reason for the reduced likelihood of receiving an antipsychotic may be that the side effects of these drugs may be more severe with advancing age. A potential explanation for the decreased likelihood of older patients to receive atypicals may be that older patients may be stable on conventional antipsychotics and either they or their clinicians are reluctant to switch.

Given that clozapine is indicated primarily for patients who are more severely ill and refractory to other medications, it was also unexpected that VA patients were significantly less likely to be prescribed clozapine. Because VA patients are poor, unemployed and often homeless,[20] one might assume that they are more severely ill than patients treated in the private sector and hence more likely to be prescribed clozapine. However, treatment with clozapine requires weekly blood monitoring for agranulocytosis, a potentially fatal blood disorder. Since VA patients are more socially isolated and disabled than private sector patients, clinicians may be less likely to prescribe clozapine in the VA due to concerns that patients would not comply with blood monitoring requirements.

The effect of comorbid psychiatric conditions was generally associated with an increased likelihood of the use of atypicals, especially risperidone and quetiapine. A potential explanantion for this result may be that these patients receive these drugs because they are more severely

Table 3. Logistic Regression Results. Receipt of Atypical Antipsychotic Medications among Patients Who Received an Antipsychotic

	Received any clozapine			Received any olanzapine			Received any quetiapine			Received any risperidone		
Independent Variable	Coefficient	p	Odds ratio	Coefficient	p	Odds ratio	Coefficient	p	Odds ratio	Coefficient	p	Odds ratio
VA patient	-1,16	**<.0001**	0,32	0,15	0,18	1,16	-0,66	**0,0006**	0,52	0,02	0,85	1,02
Age	-0,03	**<.0001**	0,97	-0,01	**0,02**	0,99	-0,02	**0,01**	0,99	0,00	0,75	1,00
Female	-0,22	0,33	0,80	-0,08	0,48	0,92	0,10	0,60	1,11	0,13	0,29	1,14
Other psychosis	-0,33	0,26	0,72	0,17	0,13	1,19	0,23	0,22	1,26	0,24	**0,04**	1,27
Dementia/Alzheimer's disease	0,14	0,76	1,15	-0,09	0,61	0,92	0,55	**0,04**	1,73	0,19	0,27	1,21
Major depression	-0,24	0,37	0,79	0,10	0,36	1,11	0,25	0,17	1,29	0,16	0,16	1,17
Bipolar disorder	0,34	0,15	1,40	0,15	0,16	1,16	0,56	**0,001**	1,74	-0,05	0,68	0,95
PTSD	-0,57	0,23	0,56	0,05	0,71	1,05	0,67	**0,002**	1,96	-0,03	0,86	0,98
Substance abuse	-0,19	0,53	0,83	0,15	0,17	1,16	0,24	0,22	1,27	-0,06	0,62	0,95
Adjustment reaction	0,20	0,68	1,22	0,23	0,25	1,26	0,02	0,95	1,02	-0,05	0,83	0,96
Anxiety disorder	0,12	0,69	1,13	-0,10	0,44	0,90	0,00	1,00	1,00	0,30	**0,02**	1,36
Personality disorder	0,06	0,89	1,06	-0,09	0,58	0,91	-0,21	0,50	0,81	0,25	0,14	1,29
Dysthymia	-0,14	0,61	0,87	0,06	0,61	1,06	0,13	0,50	1,14	-0,02	0,88	0,98
Other psychiatric diagnosis	-0,11	0,79	0,90	0,06	0,70	1,06	-0,13	0,63	0,88	0,09	0,56	1,10

ill and there is some evidence of the superiority of these medications.[21] Since quetiapine was the newest of the atypical drugs at the time of this study, many patients who had not responded to a previously released medication were likely to receive a trial of quetiapine.

Limitations

One limitation of the analyses presented in this study relates to the difficulty in measuring pharmacologic practice patterns using administrative prescription data.[1,4] We collected all prescription drug records during a one-week period, and as a result, our measures of whether a patient was dosed above PORT recommendations or received polypharmacy may be underestimated and the fraction of patients dosed below PORT recommendations may be overestimated. A longer time frame would allow identification of more prescriptions, but might unintentionally include prescriptions that had been discontinued. As physicians try different medications and dosages to find the optimal regimen for a particular patient, they may advise the patient to stop taking a previously prescribed medication and start taking a different drug or dosage. Because such instructions are not included in pharmacy claims data, we could not take them into consideration in constructing our measures. Increasing the time period over which we examine prescriptions from one week to four resulted in only a 4% increase in the proportion of patients who received polypharmacy. Hence, we believe that any bias in our results due to the one-week window is small.

Another limitation of the study relates to the generalizability of the results. Our sample consisted of patients from the VA and patients treated in the private sector in the United States. Antipsychotic prescribing patterns identified in these populations may not be indicative of prescribing patterns in other systems within the United States or internationally.

It is also difficult to determine patient diagnoses using administrative data. We identified patients as being diagnosed with schizophrenia if they had at least two claims with a primary or secondary diagnosis of schizophrenia. It is possible that patients could have been diagnosed with schizophrenia initially and then had their diagnosis changed to another psychiatric diagnosis later. Because we did not have access to more detailed clinical data for these patients, we could not assess the reliability of using administrative data to determine patient diagnoses.

A final limitation of the study is that we did not have information on depot medications. However, a previous study of antipsychotic use in the VA found that only 11.8% of outpatients received depot medications,[5] and we suspect a similar proportion were given depot medications in the private sector. Although this could affect our measure of the proportion of patients who were dosed below PORT recommendations, we feel that not being able include depot medications in the analyses does not significantly affect the overall results since data from both systems would be biased in the same way.

We should also note that while we used treatment recommendations developed by the schizophrenia PORT, there are other guidelines for antipsychotic dosing. In addition, we based our quality measures on adherence to treatment recommendations and did not include measures of patient outcomes.

Despite these limitations, this study presented a rare comparison of the quality of pharmacologic care for schizophrenia, the most debilitating of mental illnesses, across public and private service systems. Despite treating a more socially disadvantaged population, the VA performed about the same as the private sector on the measures examined here. Our finding that only 70 to 80 percent of patients with schizophrenia were documented as receiving an antipsychotic is potentially a cause for concern. Further research is needed to determine what factors affect choice of pharmacotherapy and their implications for patient satisfaction and well-being.

Appendix

Condition: ICD-9 Codes

Adjustment reaction: 309.00-309.80; 309.82-309.99
Anxiety disorder: 300.00-300.39; 300.41-300.99
Alzheimer's disease/dementia: 290.00-290.99, 293.00-294.99, 331.00, 310.00-310.99
Bipolar disorder: 296.00-296.19; 296.40-296.80
Dysthymia: 300.40-300.49; 296.90-296.99; 311.00-311.99; 301.10-301.19
Major depression: 296.20-296.39
Other psychosis: 297.00-299.99
PTSD: 309.81
Personality disorder: 301.00-301.09; 301.20-301.99
Substance abuse: 303.00-303.99; 305.00 (Alcohol Abuse) 292.00-292.99; 304.00-304.99; 305.20-305.99 (Drug Abuse)
Other mental health disorders: 290.00-312.99; 331.00-331.99 not elsewhere classified

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