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SOME DETERMINANTS OF DIAGNOSIS AND NEUROLEPTIC ADMINISTRATION AMONG SCHIZOPHRENIC AND MOOD DISORDERED VA PATIENTS

Ira H. Bernstein
The University of Texas at Arlington

Robert M. Kolodner
Department of Veterans Affairs Central Office and the
University of Maryland at Baltimore

T. Michael Kashner
Dallas VA Medical Center and The University of Texas Southwestern Medical Center at Dallas

ABSTRACT

This study examined diagnostic practices and neuroleptic use at four general medical and surgical VA medical centers. Most effects were as expected, e.g., patients administered neuroleptics during a prior hospitalization and who exhibited more psychotic symptoms were more likely to be diagnosed with schizophrenia than with a mood disorder. However, the centers differed in their diagnostic practices after adjusting for such differences in symptomatology. As a result, patients were more likely to receive neuroleptic medication when treated at certain hospitals relative to others even though these differences followed directly from differences in diagnostic practices. Further research is needed to determine the extent to which these different diagnostic practices reflect variation in training, theoretical orientation, documentation, or justification for particular psychiatric practices. Regardless, they have significant legal and professional ramifications.

INTRODUCTION

In principle, a psychiatric patient should receive the same diagnosis and treatment regardless of where he or she is seen. However, various factors that lead to differences in diagnosis and therapy have been noted. For example, prior to DSM-III, there was a major difference between British and American's conceptions of schizophrenia, (Kendell, Cooper, Gourlay, Copeland, Sharpe, & Gurland, 1971). Even at the same institutions, such factors as theoretical orientation or personal idiosyncrasies have been noted (e. g., Gillis & Moran, 1981; Gillis, Lipkin, & Moran, 1981).

Although one might study variation in diagnostic practice by seeing the same patient at different hospitals, it is more realistic to compare records that reflect different patients. Unfortunately, hospitals can and do differ with respect to their patient populations. Various suitable models exist to adjust for these differences statistically, as will be done in this paper, but these adjustments are no better than their file data. Hospitals can thus differ because the hospitals vary in their record keeping even if their diagnostic and therapeutic practices were the same.

This study examines differences in diagnosis and practice using multivariate procedures to infer the bases of clinical judgment, following in the tradition of Gillis and Moran (1981; Gillis, Lipkin, & Moran, 1981), among others. In particular, we examined such differences as they affected patients diagnosed with schizophrenia, major depression, or bipolar disorder. Differences were studied at the level of the institution, in particular, the VA. VA medical centers are of especial interest because of the efforts they make to insure standardized care and the number of patients they treat. Such standardization would not, for example, be expected, were one to compare public and privately funded hospitals. Yet, differences among psychiatric and general medical institutions within the VA pose problems for standardization. One novel aspect of the investigation is that it uses techniques to analyze such categorical criteria as diagnosis that have only become popular in very recent years. The particular model, loglinear analysis, is described in Wickens (1989). A second, more substantive, question was considered. Assume that VA centers do differ with regard to both diagnosis and treatment. A diagnosis is often conceived of as a plan of therapeutic action (e.g., Cole & Magnussen, 1966). If this were followed, differences in treatment might vanish after differences in diagnosis are controlled as diagnosticians, especially in the VA, may only differ in their criteria for diagnosis. Conversely, it is not unreasonable to expect differences in treatment even controlling for differences in diagnosis.

The questions being asked — what processes emulate psychiatric diagnoses and what implications do these diagnoses have for treatment — are hardly new. However, these questions have been ignored in the past decade though numerous studies were concerned with interrater reliability among mental health practitioners, such as Regier, Kaelber, Roper, Rae, et al. (1994), between a practitioner and another instrument like the SCID (Dunner & Tay, 1993), Millon (Patrick, 1993), or multiple measures (Perry, 1992) . Likewise, studies also examined the validity of various instruments in relating to psychiatric judgments, such as Lesher and Berryhill (1994).

METHOD

The data were 773 records of inpatients diagnosed with schizophrenia, major depression, or bipolar disorder at one of four VA medical centers code named "Alpha," "Beta," "Gamma," and "Delta" (n = 196, 277, 111, and 189, respectively). The VA considers all four to be general medical and surgical hospitals. However, Beta has a relatively large percentage of psychiatric patients and is the only one of the facilities with beds for long-term psychiatric patients. The 773 records were derived from a base of 999 consecutive admissions with these ICD discharge diagnoses of 296.4-296.6 (Bipolar disorder), 296.2-296.3 (Depressive disorder), or 295.1-295.3, 295.6 and 295.9 (Schizophrenia) obtained from a

regional VA office. The initial data included patients transferred in to site Beta, but excluded any patients transferred out of the site to which they were admitted. Records were excluded past this initial point because: (a) they came from a center providing less than 100 cases ($N = 77$ over three sites), or (b) they came from a selected site but had not been reviewed or scanned by Medipro, the VA quality assurance system ($N = 149$). All patients were male.

Each record contained (1) the code for the VA medical center treating the patient, (2) diagnosis (bipolar disorder major depression, or schizophrenia), (3) age at time of treatment, (4) inpatient length of stay, (5) prior neuroleptic administration ("use in the distant past," "use in the recent past," "never," or "unknown"), (6) description of previous compliance with neuroleptics ("compliant," "not compliant," "unknown," or "not applicable" — the patient had not been previously administered a neuroleptic), (7) a list of psychotic symptoms, (8) whether or not the patient was administered a neuroleptic as an inpatient, (9) whether or not the symptoms had been adequately documented, (10) whether or not neuroleptic medication was continued when the patient was released from the hospital, (11) whether informed consent had been obtained for neuroleptic medication ("yes or partial" — as full consent was rarely obtained, "no," or "not applicable" — the patient was not administered neuroleptics), and (12) whether the discharge was regular or irregular. The file also contained an additional 20 variables such as whether or not they were administered a tardive dyskinesia examination and the specific DSM-III-R code, but these variables will not be considered in this paper.

There are two basic ways to incorporate the specific symptoms in the statistical models reported below. One is to use a dummy (1 vs. 0) code for presence vs. absence of each specific symptom, which allows each symptom to contribute differentially. The other is to simply use a count of number of symptoms, which weights each symptom equally. The latter was chosen to report for two reasons, one statistical and one substantive. The statistical reason is that many fewer parameters need be estimated. Even though the sample size was fairly large, this minimizes the extent to which the results capitalize upon chance. Second, results such as those noted above (Gillis & Moran, 1981; Gillis, Lipkin, & Moran, 1981) attest to the individual differences among clinicians. This means differential weighting would merely describe an average of an arbitrarily chosen group of individuals and would not be descriptive of any given VA center. Similarly, even though weights could be estimated separately for each center to examine differences among centers, each set would also reflect the arbitrarily formed average of the various clinicians at that site and time. In fact, preliminary analysis indicated that the "it don't make no nevermind" principle held. This principle (Kaiser 1970; Wainer, 1976) states that equal weighting of a set of predictors often leads to highly similar results as differential weighting. It does not mean that the clinicians consciously counted number of symptoms, only that their judgments can be emulated in this manner. In addition, there were no GAS scores or other measure of symptom severity or overall functioning.

Five individuals skewed lengths of stay as they had more than two years hospitalization. Their values were limited to 730 days.

RESULTS

Observed differences among VA centers. Table 1 contains the percentages of cases diagnosed as schizophrenia, major depression, and bipolar disorder at the four centers. As noted above, these were the only three diagnoses possible within this sample. The footnote to this table indicates that a χ^2 test of association was significant ($p < .01$); the distribution of diagnoses therefore varied significantly across the centers. Patients seen at centers Alpha and Beta are usually diagnosed with schizophrenia (79.6% and 79.1%), but Alpha diagnoses nearly equal percentages as having a major depression or a bipolar disorder (11.2% and 9.2%) whereas bipolar diagnoses predominate at Beta (5.5% vs. 15.5%). Conversely, nearly half of the patients seen at Gamma are diagnosed as having a major depression. These differences reflect, in part, differences in the missions of these centers, i.e., whether they are designed for acute or chronic psychiatric care.

Table 1 also contains data regarding: (1) prior neuroleptic status, (2) compliance, (3) inpatient neuroleptic administration, (4) adequacy of symptom documentation, (5) neuroleptic continuation on outpatient basis, (6) informed consent, and (7) discharge status at each VA medical center. As footnoted, all χ^2 values testing for equal distributions of these percentages across VA centers were significant (at $p < .01$).

Table 2 contains the mean age (in years), length of stay (in days), and number of symptoms reported. Simple analyses of variance were conducted upon each of these three measures, and, in each case, the groups varied significantly. The respective F-ratios were 4.11, 18.48, and 11.16, and all were significant at $p < .01$.

Thus, the patients vary across VA centers with respect to a number of variables. Over 90% of the patients at Alpha and Beta receive neuroleptics while hospitalized, which is continued after discharge on over 85% of the patients whereas less than 65% are administered neuroleptics while hospitalized and as outpatients at Gamma. Paralleling these differences in diagnosis and medication, more psychotic symptoms are reported at Alpha and Beta than at Gamma. However despite the similarities in rates of schizophrenia diagnoses at Alpha and Beta, the mean length of stay is over twice as long at Beta than at Alpha (36.4 vs. 80.1 days). As noted above, Beta was the only one site with long-term psychiatric beds, so this is not unexpected. The remaining sites transferred patients to Beta though, as noted, patients transferred out of a site were excluded from the study. Similarly, although Delta diagnoses more patients as schizophrenic than Gamma (52.4% vs. 29.7%), fewer symptoms are reported at Gamma (1.9 vs. 1.7). Even though the age differences are not large in an absolute sense, there is a 4.2 year difference between Gamma at the one extreme (43.5 years) and Beta at the other (47.7%).

In addition to these differences in diagnosis and treatment, other fairly large differences appeared with respect to compliance, where only 11.7% of Alpha's patients vs. 20.7% of Gamma's patients were classified as compliant. In contrast to Gamma, where only 76.6% of the patient files had symptom documentation, the rates were in excess of 90% for Alpha and Beta. Partial or full informed consent for neuroleptic use ranged from 0% at Delta to 28.1% at Beta. Finally, only 4.7% of the discharges at Delta were irregular whereas over 15% were at

TABLE 1
CHARACTERISTICS OF FOUR VA MEDICAL CENTERS (AS PERCENTS)[2]

	VA Medical Center			
Variable	Alpha	Beta	Gamma	Delta
Diagnosis				
Schizophrenia	79.6	79.1	29.7	52.4
Major Depression	11.2	5.4	45.1	27.0
Bipolar Disorder	9.2	15.5	25.2	20.6
Prior Neuroleptic Administration				
Distant Past	13.8	9.0	16.2	12.2
Recent Past	55.6	56.7	32.4	53.4
Never	14.3	13.4	46.0	12.2
Unknown	16.3	20.9	5.4	22.2
Prior Neuroleptic Compliance				
Compliant	11.7	14.8	20.7	18.1
Not Compliant	35.7	27.1	15.3	29.8
Unknown	35.2	42.2	15.3	18.6
Not Applicable	17.4	15.9	48.7	33.5
Were Neuroleptics Administered While in Hospital?				
Yes	86.2	95.0	62.2	78.3
No	13.8	5.1	37.8	21.7
Were Symptoms Documented?				
Yes	90.8	95.0	76.6	82.0
No	9.2	5.1	23.4	18.0
Were Neuroleptics Continued After Discharge?				
Yes	75.0	85.2	62.3	84.5
No	25.0	14.8	37.7	15.5
Was Informed Consent Obtained For Neuroleptic Use?				
Yes/Partial	3.6	28.1	13.0	0.0
Never	70.4	55.9	49.3	83.1
Not Applicable	26.0	16.0	37.7	16.9
Type of Discharge				
Regular	83.4	91.3	84.1	95.3
Irregular	16.6	8.8	15.9	4.7

Note: The values of χ^2 testing the null hypothesis that these percentages are equal across the four VA medical centers are all significant at $p < .01$.

Alpha and Gamma. In sum, there are fairly wide differences among these centers with regard to all major variables.

TABLE 2
MEANS (M) AND STANDARD DEVIATIONS (SD) OF AGE (IN YEARS), LENGTH OF STAY (IN DAYS), AND NUMBER OF SYMPTOMS AT FOUR VA MEDICAL CENTERS

		VA Medical Center			
Variable		Alpha	Beta	Gamma	Delta
Age	*M*	44.7	47.7	43.5	44.7
	SD	13.1	13.1	12.8	12.7
Length of Stay	*M*	36.4	80.1	48.6	24.2
	SD	19.5	140.3	39.8	16.2
Number of Symptoms	*M*	2.3	2.3	1.9	1.7
	SD	1.3	1.1	1.6	1.2

Loglinear analyses. Loglinear analysis (see Wickens, 1989), as implemented in SAS Institute's (1985) PROC CATMOD, was used to estimate what differences might exist among the centers after adjusting for differences in their patient characteristics. This is a form of regression analysis suitable to categorical criteria. Instead of modeling a criterion directly, it models the natural logarithm of the ratio of a target category to a given reference criterion. Such log ratios are known as log-odds ratios.

The first set of models concerns diagnosis. We began using (a) number of symptoms, (b) age, (c) length of stay, (d) prior neuroleptic administration, (e) prior compliance with neuroleptics, and (f) number of symptoms as predictors. Predictors (b), (c), and (f) are quantitative, and the remainder are categorical. However, length of stay and prior compliance did not contribute significantly to this model. The decrease in the residual error, defined as a maximum likelihood chi-square (G^2), was a non-significant 5.39 ($df = 8$) when they were removed.[1] In contrast, all remaining variables contributed significantly to the reduced model, and the removal of any increased the residual error significantly. In particular, removing VA medical center as a predictor increased the error G^2 by 100.28, $p < .01$, $df = 6$. Consequently, centers differ in diagnostic practice even after adjusting for patient characteristics.

The resulting model provides parameter estimates for diagnosis: (a) schizophrenia and (b) major depression relative to diagnosis of bipolar disorder. These parameter estimates are equivalent to beta weights in ordinary linear regression in that each effect controls for all others in the model. Parameter estimates for

categorical predictors describe the association between a given category relative to a reference category (Beta for VA medical center and "not applicable" for prior neuroleptic administration) and the two criteria as a log odds ratio. The parameter estimates for quantitative predictors estimate the change in log criterion ratio per unit change in the predictor, i.e., slope. Taking the antilog of the parameter estimates (exponentiating) provides odds ratios, which are presented in Table 3. The model also contains an intercept term reflecting overall differences in the three categories of diagnosis. This is of minor interest and is not presented.

TABLE 3
ODDS RATIOS FOR DIAGNOSIS OF SCHIZOPHRENIA AND MAJOR DEPRESSION RELATIVE TO BIPOLAR DISORDER[3]

		Odds Ratio	
Effect	*Level*	*Schizophrenia*	*Major Depression*
VA Medical Center	Alpha	2.77**	1.05
	Gamma	0.32**	1.82*
	Delta	0.70*	1.39
Prior Neuroleptic Administration	Recent Past	2.06**	0.43*
	Distant Past	0.84	0.81
	Never	0.44**	1.72*
Number of Symptoms	(Quantitative Variable)	1.41**	0.64*
Age	(Quantitative Variable)	0.97**	1.01

Note: VA Medical Center Beta and the Not Applicable level of Prior Neuroleptic Administration are reference levels with odds ratios of 1.0, by definition.
* $p < .05$. ** $p < .01$.

Thus, schizophrenia is diagnosed 2.77 times as often as bipolar disorder at Alpha than at reference Beta. This ratio is significantly greater than the 1.0 expected were there no difference between centers once the remaining variables in the model were controlled. In other words, a patient of given age, neuroleptic history, and number of symptoms is more likely to be diagnosed schizophrenic at Alpha than at Beta. In contrast, the ratios are significantly lower at Gamma and Delta, 0.32 and 0.70, respectively. The odds of a person's being diagnosed as schizophrenic were 2.06 times greater for an individual who had been administered neuroleptics in the recent past as compared to someone for whom neuroleptic administration was inapplicable ($p < .01$). However, the odds did not differ significantly from 1.0 for someone who was administered neuroleptics in the

distant past and were significantly less than 1.0 for someone for who never had been administered neuroleptics. In addition, the odds of being diagnosed schizophrenic increased by 1.41 per symptom and decreased by .97 per year of age (both significant at $p < .01$).

The odds in favor of being diagnosed as depressed relative to bipolar were equivalent at Alpha, Delta and Beta, but were higher at Gamma. Recent administration of neuroleptic administration decreased the odds of being diagnosed as depressed relative to "not applicable," but never having been given a neuroleptic increased these odds. Finally, the more psychotic symptoms a patient exhibited, the less likely he is to be diagnosed as depressed.

The next models evaluated the determinants of being administered neuroleptics while hospitalized. First, the variables originally used to predict diagnosis plus the diagnosis itself were used as predictors. Age, length of stay, and compliance with prior neuroleptic administration were then removed as the increase in the error G^2 was a nonsignificant 8.04 ($df = 5$) following their elimination. Removing VA medical center from the model increased the error G^2 by 8.16 ($p < .05$, $df = 3$). However, none of the individual centers differed significantly from the baseline so it too was removed. This indicates that treatments were in fact similar across the centers once differences in their diagnostic practices were controlled.

Table 4 contains the odds ratios associated with the remaining predictors: diagnosis, prior neuroleptic administration, and number of symptoms. As can be seen, being schizophrenic increased the odds of neuroleptic administration and depressed reduced these odds relative to bipolar disorder. Recent administration of neuroleptics also increased these odds, whereas administration in the distant past or never having been administered neuroleptics decreased the odds relative to "not applicable." Finally, administration of neuroleptics is highly related to number of symptoms at time of admission.

TABLE 4
ODDS RATIOS FOR INPATIENT ADMINISTRATION OF NEUROLEPTICS[4]

Effect	*Level*	*Odds Ratio*
Diagnosis	Schizophrenia	4.05**
	Major Depression	0.40**
Prior Neuroleptic Administration	Recent Past	6.71**
	Distant Past	0.30**
	Never	0.41**
Number of Symptoms	(Quantitative Variable)	11.28**

Note: Bipolar disorder and the Not Applicable level of Prior Neuroleptic Administration are reference levels with odds ratios of 1.0, by definition.
** $p < .01$.

A third series of models considered whether or not the patient would be prescribed neuroleptics upon discharge. This analysis was limited to 579 regularly discharged patients who had been administered neuroleptics while hospitalized. Starting with the original six variables plus diagnosis, it was possible to eliminate number of symptoms and prior compliance as they failed to contribute to the model when included and did not significantly increase the error when excluded ($G^2 = 8.10$, $df = 4$). The same held true for differences among VA medical centers. This again indicates the similarity in treatment once difference in diagnosis is controlled. The odds ratios for the remaining variables, diagnosis and prior neuroleptic administration are presented in Table 5. As can be seen, a diagnosis of schizophrenia and recent administration increases the odds of being continued on medication, whereas major depression, administration in the distant past or never decreases the odds as compared to the baselines provided by bipolar disorder and ''not applicable.'' Again, VA medical center does not play a direct role, but it is important indirectly since it is associated with differences in diagnosis.

TABLE 5
ODDS RATIOS FOR CONTINUATION OF NEUROLEPTICS AFTER DISCHARGE

Effect	*Level*	*Odds Ratio*
Diagnosis	Schizophrenia	3.89**
	Major Depression	0.45**
Prior Neuroleptic Administration	Recent Past	2.85**
	Distant Past	0.58*
	Never	0.49*

Note: Bipolar disorder and the Not Applicable level of Prior Neuroleptic Administration are reference levels with odds ratios of 1.0, by definition.
* $p < .05$. ** $p < .01$.

Evaluation of the models. At present, there is no universally accepted description of the fit of a loglinear model to parallel the multiple correlation (R) in ordinary least squares regression. This is a particular problem in evaluating diagnostic practice since there are three nominal criterion categories. The predicted probabilities of the three diagnoses are, however, available for correlation with actual outcomes over patients. Because these predicted probabilities employ information from four predictors, their correlations with the respective outcomes are, in fact, multiple correlations (R). These values of R were 0.61, 0.62, and 0.19 for the respective presence vs. absence of schizophrenia, major depression and bipolar disorder. Further analysis indicated that bipolar disorders were predicted poorly because the model tended to underdiagnose them. All three correlations are also attenuated because the three actual outcomes are categorical and the three

predicted outcomes are continuous variables. Using the largest of the three probabilities as a patient's predicted diagnosis, only 1.2% of the cases was predicted to be bipolar disorders vs. 16.6% in actuality. The model did predict 76% of the diagnoses correctly.

The evaluation is simpler for the other two criteria, which are presence/absence dichotomies. A single value of R is sufficient in each case. These values were 0.86 and 0.46 for inpatient neuroleptic administration and its continuation. The model correctly classified 95% and 88% of the respective outcomes.

DISCUSSION

There are obvious differences among hospitals in terms of their mission and, as a result, the patients they see. However, these differences are insufficient to account for differences in diagnosis at these centers. For example, Alpha and Beta had highly percentages of patients diagnosed as schizophrenic (Table 1) yet they were the most disparate with regard to the model parameters for the diagnosis of schizophrenia (Table 3). Conversely, these same two tables show that Alpha and Gamma were the two most disparate with regard to percentages of schizophrenic patients yet their model parameters were the most similar. The extent to which idiosyncrasies in diagnostic practice versus systematic differences due to such factors as differences in training and theoretical perspective contribute to these overall differences cannot be determined from the present data as we have no access to the clinicians' backgrounds. Although one might argue that patients admitted to a psychiatric hospital should be classified as schizophrenic more frequently than patients seen at general medical and surgical hospitals, it is unclear why this would be the case after symptomatology is controlled since the former group should be more symptomatic, in general. In other words, it is not clear (and it may not be clear to a jury deciding a malpractice case) why two patients with the same symptoms seen at these different settings would be diagnosed differently. It is also of interest to note that even though such variables as age and prior neuroleptic history are not part of DSM, they do contribute to explaining clinician's diagnostic behavior and treatment independently of symptomatology. Note that if these non-symptomological variables were to merely correlate and not contribute independently, they would have received nonsignificant weights in the equations.

Our results clearly stress the importance of understanding the bases of diagnoses since both inpatient and outpatient neuroleptic administrations are highly predictable from this information. Once a patient is diagnosed, differences among hospitals disappear with respect to both inpatient and outpatient neuroleptic administration. This does not mean that the probability that a given patient will be administered a neuroleptic at the different centers is the same. For example, because patients with the same number of symptoms and prior neuroleptic history are more likely to be diagnosed as schizophrenic at Alpha than at any of the other centers, they are also more likely to be administered neuroleptics because of the diagnosis. The increased possibility of side effects like tardive dyskinesia does not depend upon whether these differences are directly due to differences among centers or are an indirect consequence of differences in diagnostic practice. These differences among centers might also produce social consequences that reflect the

differences in the stigma of the various diagnoses, although some suggest this effect is weak (Gove & Fain, 1973). In general, the remaining variables that entered into the three models presented above did so in a reasonable manner, e.g., one would expect patients with diagnoses of schizophrenia or bipolar disorder to exhibit more psychotic symptoms than patients with symptoms of major depression. Prior neuroleptic history and diagnosis played similar roles in the inpatient and outpatient administration of neuroleptics.

These conclusions are only as good as the completeness of model specification (inclusion of relevant predictors and exclusion of irrelevant ones). Indeed, we find it quite likely that unspecified variables accounts for differences among hospitals, especially at psychiatric vs. general medical and surgical centers. However, these data were not present in the patient records and therefore could not be defended under challenge. A variant on this issue is that clinician's differ in their criterion for reporting a symptom because of differences in the base rates for that symptom at that setting. A given patient might be less likely to be judged as delusional, for example, if a high percentage of individuals at that setting are delusional. Again, that possibility needs documentation in some way when challenged.

Some variables, such as length of stay, which correlate with diagnosis, did not need to be included in the model because they were redundant with respect to those that were. As Nunnally and Bernstein (1994), among others, point out, including more than the best three or four predictors in a model rarely has any major effect on the results of a regression analysis. Moreover, Fenton and McGlashan (1989; also see Lipkowitz & Idupugnati, 1985) also found that relatively few symptoms need be considered to emulate clinician's diagnostic practices accurately. Differences among hospitals in their rate of diagnosing schizophrenia were in fact quite large and unlikely to be greatly affected by including more information from the present database. However, the more subtle differences in prediction of major depression might be affected more.

In contrast to the minimal expected change in the present set of observations that a more complex specification would produce, it seems more likely more adequate documentation of symptoms would have a much larger effect. Number of symptoms is a major determinant of all criteria so it is vital this be adequately documented. Recall that there was a 20% range in symptom documentation, a 30% range in reviewing records, and 149 records had to be eliminated prior to analysis. We cannot rule out the possibility that this difference in symptom documentation, rather than the difference in diagnostic practice, will ultimately prove the critical finding of this paper. Regardless, we underscore the social and legal importance of justifying psychiatric diagnosis and treatment, particularly in light of the current debate about government's role in health care.

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Author notes

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Footnotes

1. The symbol G^2 conventionally describes a likelihood ratio chi-square to differentiate it from the more widely used Pearson statistic (χ^2), as used in Table 2. The two chi-square values converge in large samples (Wickens, 1989)
2. The values of χ^2 testing the null hypothesis that these percentages are equal across the four VA medical centers are all significant at $p < .01$.
3. VA Medical Center Beta and the Not Applicable level of Prior Neuroleptic Administration are reference levels with odds ration of 1.0, by definition.
$^{*}p < .05$ and $^{**}p < .01$
4. Bipolar disorder and the Not Applicable level of Prior Neuroleptic Administration are reference levels with odds ration of 1.0, by definition. $^{**}p < .01$