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Clinical Variables Impacting Prescribing of Olanzapine, Quetiapine, and Risperidone

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Abstract

Objective—To identify determinants of new use of the first-line SGAs associated with weight gain.

Design—Retrospective chart review.

Setting—Outpatient and inpatient psychiatry services at a tertiary, academic medical center.

Patients—Sample of 340 consecutive patients over two time periods with major depression with psychotic features, bipolar I, bipolar II, bipolar not otherwise specified, and schizoaffective disorder.

Interventions—None.

Measurements and Main Results—Clinical and sociodemographic variables associated with new use of olanzapine, risperidone, and quetiapine were identified using univariate and multivariate logistic regression. Several clinical factors were individually associated with initiation of these SGAs: mania (OR 3.6, 95% CI 1.2–10.8), psychosis (OR 3.3, 95% CI 1.5–6.9), and inpatient treatment (OR 3.8, 95% CI 1.8–7.9). Prevalent use of lithium (OR 0.3, 95% CI 0.1–0.9) and being married (OR 0.3, 95% CI 0.1–0.8) were inversely associated. Mania, psychosis, married status, and lithium use remained independently associated on multivariate analysis. Factors related to metabolic or vascular risk were not associated with SGA initiation.

Conclusions—Psychiatric clinicians weigh clinical features related to mental status and acuity heavily in determining whether to initiate SGAs. However, factors related to vascular risk were not associated. Future observational studies should consider current clinical status as an important

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factor in determining propensity to receive antipsychotics or other acute treatments for bipolar disorder.

Keywords

Antipsychotic agents; Bipolar disorder; Inpatients; Logistic models; Major Depressive Disorder; Outpatients; Propensity Score; Psychotic Disorders

Introduction

Second generation antipsychotics (SGAs) are commonly prescribed in the treatment of bipolar disorders.[1,2] Despite the reduced propensity for extrapyramidal symptoms compared to first generation antipsychotics,[3,4] especially high-potency first-generation antipsychotics,[5] SGAs have increasingly been associated with significant metabolic complications such as the metabolic syndrome and its components of dyslipidemia, insulin resistance, and obesity.[6,7] SGAs produce variable weight gain, greatest for clozapine and olanzapine; then quetiapine and risperidone.[8] Clozapine tends to be reserved for treatment refractory cases because of its side-effect profile and subsequent need for routine laboratory monitoring. The CATIE schizophrenia clinical trial found that change in Framingham-calculated 10-year coronary heart differed most between agents for participants who were at highest vascular disease risk at the outset of antipsychotic treatment.[9] Although not reflected in practice guidelines for bipolar disorder,[10] existing data support antipsychotic selection based on impact on vascular disease risk factors and the American Diabetes Association and American Psychiatric Association consensus statement recommends “it may be preferable to initiate treatment with an SGA that appears to have a lower propensity for weight gain or glucose intolerance” for at risk patients.[7]

With regard to vascular disease outcomes, a meta-analysis of clinical trials of antipsychotics in samples with dementia or related conditions found increased cerebrovascular events in those assigned antipsychotics.[11] Owing to the infrequency of vascular events in younger samples, data linking antipsychotics to vascular outcomes is limited to large, pharmacoepidemiological studies.[12–16] However, these studies are sensitive to confounding by indication and key confounders, such as presenting clinical symptoms, health behaviors, and body mass index (BMI), may be unavailable in administrative claims databases. Unfortunately, there exists a paucity of data regarding the determinants of antipsychotic prescribing in bipolar and related disorders.[1,2] Information about the clinical features associated with initiation of specific SGAs may be useful in the design and interpretation of such studies. We sought to determine what patients from a clinical sample of outpatients and inpatients with diagnosis of a bipolar or related affective disorder are most likely to be prescribed three first-line SGAs with greater propensity for weight gain: risperidone, olanzapine, and quetiapine. Our primary hypotheses were that patients started on these SGAs would be more likely to have manic or psychotic symptoms and less likely to have risk factors for vascular disease compared to the remainder of the sample not started on these medications.

Methods

The University of Iowa Institutional Review Board approved this study. All consecutive patients aged 18 years and above during August 30-October 30, 2009 and April 1-May 31, 2010 with an encounter that included primary chart diagnosis of a bipolar or related affective disorder including Bipolar I, Bipolar II, Bipolar Not Otherwise Specified (NOS), Schizoaffective disorder (bipolar subtype), and Major Depressive Disorder with psychotic features were included. These disorders have been considered to represent a spectrum of

related conditions.[17–19] To maintain as representative a clinical sample as possible, no other inclusion or exclusion criteria were applied. We identified individuals who were newly prescribed an SGA associated with weight gain (risperidone, olanzapine, quetiapine) during a visit in these windows. New users could have been on a different antipsychotic at the time the SGA was initiated. Based on the written notes for the first visit at which one of these medications was prescribed, we determined whether this was a new SGA user, herein used to refer to a new user of risperidone, olanzapine, or quetiapine. All other individuals comprised the comparison group. In the case of multiple visits, only one visit was abstracted. This was the visit at which SGA was initiated or, for those who did not initiate SGA, the last visit in the study period. Clinical and sociodemographic variables were abstracted to assess differences between new users of SGAs and all other individuals.

Age, gender, race, ethnicity, marital status, and insurance were obtained from the electronic hospital records. Type of insurance was classified as private, public, or none. Clinical features of the disorder were abstracted from the index visit narrative and mental status exam in the following categories: depressed, manic, psychotic, and suicidal. Active substance abuse was also noted. Measures of weight and body mass index were obtained from the records for each visit or the most recent prior visit when not available. Obesity was determined from a chart diagnosis or BMI≥30. The presence of hypertension or diabetes was determined by chart diagnosis of or treatment for the respective condition. These diagnoses were not inferred from vital signs or laboratory values. Psychotropic medications and any new prescriptions of SGAs were recorded. New use was noted irrespective of current or recent medications.

All statistical analyses were performed using SAS software, version 9.2.[20] The study demonstrated 81% power to detect a medium effect size of 0.5 standard deviations for continuous variables. Descriptive statistics were generated. Univariate analyses assessed the association of new use of SGAs with the abstracted clinical and sociodemographic variables. Independent samples t-tests and chi-square tests were applied to identify associations between continuous and categorical variables, respectively, by new use of SGAs. With new SGA use as the dependent outcome variable of interest, logistic regression models were explored to find the most useful multivariate model. The following independent variables were considered: age; gender; race (white or non-white); married status (married or not married); insurance type; inpatient setting; prevalent use of lamotrigine, lithium, valproic acid, or antipsychotics; suicidal ideation; psychosis; depression; mania; active substance abuse; diagnosis or treatment of diabetes; diagnosis or treatment of hypertension; and obesity. Given the correlation of certain independent variables considered, stepwise procedures were deferred. Model selection began with significant variables from univariate analyses and sought a plausible model that minimized the Schwarz information criterion, which was selected over the Akaike information criterion to reduce the risk of overfitting by imposing a greater penalty for the number of model parameters.[21] Continuous variables were assessed for possible non-conformity to a linear gradient. Interactions were considered. Goodness of fit was assessed using the Hosmer-Lemeshow statistic.

Results

From a total of 735 inpatient and outpatient psychiatry visits for 340 patients, 36 (11%) new users of the 3 first-line SGAs associated with weight gain (risperidone, olanzapine, quetiapine) were identified in the period sampled. The remaining 304 patients served as the comparison group. As shown in Table 1, the mean (SD) age of all participants was 46.4 (15.9). Approximately one third (34%) of chart diagnoses in this sample were for bipolar I. With regard to clinical features, 17% of the patients had some evidence of psychosis, 19% were depressed, 5% were manic, and 6% were suicidal. Nearly half of the patients (48%)

were obese. Other clinical and sociodemographic characteristics of this sample are outlined in Table 1. Data on weight and body mass index was missing for 8% and 14% of cases, respectively.

In univariate logistic regression, the presence of mania (OR 3.6, 95% CI 1.2–10.8, χ^2=5.28, df=1, p=0.02), psychotic symptoms (OR 3.3, 95% CI 1.5–6.9, χ^2=9.50, df=1, p=0.002), and treatment in an inpatient setting (OR 3.8, 95% CI 1.8–7.9, χ^2=12.22, df=1, p=0.0005) were associated with new use of a SGA. Prevalent use of lithium (OR 0.3, 95% CI 0.1–0.9, χ^2=4.80, df=1, p=0.03) and married status (OR 0.3, 95% CI 0.1–0.8, χ^2=5.22, df=1, p=0.02) were inversely associated with new use of a SGA. Other clinical and sociodemographic variables were not significantly associated with the initiation of SGAs, including obesity (OR 1.3, 95% CI 0.6–2.6, χ^2=0.40, df=1, p=0.52), hypertension (OR 0.5, 95% CI 0.2–1.4, χ^2=1.71, df=1, p=0.19), and diabetes (OR 0.6, 95% CI 0.2–2.2, χ^2=0.45, df=1, p=0.50).

The optimal multivariate model included prevalent lithium use, mania, married status, and psychosis as shown in Table 2. The overall model was significant (Likelihood Ratio χ^2=25.92, df=4, p<0.0001) and demonstrated goodness-of-fit (Hosmer and Lemeshow χ^2=2.46, df=4, p=0.65) with an area under the curve of 0.77 (95% CI 0.70–0.85) on receiver operating characteristic analysis.

Discussion

SGAs are a common treatment for bipolar and related disorders though it is unclear how psychiatric clinicians select these medications in practice, particularly those agents with a greater propensity for weight gain. In this analysis of clinical data from inpatient and outpatient psychiatric settings at a tertiary care center, risperidone, olanzapine, and quetiapine appeared to be more likely to be initiated in the presence of appropriate target symptoms, mania or psychosis, especially in the higher acuity inpatient setting. These medications were less likely to be prescribed to individuals who were married or on lithium. Married status may reflect some marker of illness severity or function. Lithium may reduce risk through mania prophylaxis,[22,23] though similar findings were not seen with valproic acid or lamotrigine. Those treated with lithium may be a select group, with lithium responders even considered a specific subtype,[24] and causal conclusions cannot be made from this data.

In an analysis of the National Ambulatory Medical Care Survey, prescription of SGAs was associated with a diagnosis of manic (odds ratio=10.3, 95% CI=2.0–52.0) or mixed (odds ratio=6.9, 95% CI=1.6–30.1) subtypes.[25] Our findings extend these results beyond a diagnostic subtype to a current clinical presentation with mania or psychosis. In a sample of Veterans with bipolar disorder, blacks were more likely than non-blacks to receive first but not second generation antipsychotics.[2] Our study found no racial differences though our sample was predominantly white.

Potential limitations included the limitations of medical record data and some limitations in generalizability due to the tertiary care practice setting and homogeneous racial ethnic composition of the study population. Chart diagnoses for psychiatric conditions were made by faculty psychiatrists though could not be verified by structured interview. Presumably prescribing patterns were based on the diagnosis made, mitigating the effect of any misclassification. Individual diagnoses did not appear to discriminate for new use of SGAs. If documentation did not include a diagnosis of or treatment for conditions such as hypertension or diabetes, these conditions were classified as not present. The potential to underestimate the prevalence of these conditions could reduce the ability to identify associations between the presence of these conditions and prescribing. Our data included

current medications but lacked a history of prior medications. Our sample, consistent with the population of Iowa, included a preponderance of white patients. This impeded our ability to assess racial differences and may further limit the generalizability of our findings. Our sample also consisted only of those receiving treatment from psychiatric clinicians and may not reflect the practice of non-psychiatric clinicians, who perhaps consider clinical data differently. The results also may not generalize to prescribing of other antipsychotics or mood stabilizers. Nonetheless, this sample is a naturalistic reflection of psychiatric practice in a large, tertiary care hospital, allowing assessment of predictors for prescribing risperidone, olanzapine, and quetiapine in a real-world setting, wherein the prevalence of antipsychotic use was consistent with prescribing data for other samples with bipolar disorder.[2]

Our paper found that clinical variables related to baseline mental status, many of which may not be readily available from administrative claims data, appear to be important predictors of antipsychotic prescribing akin to antidepressant prescribing.[26] Because of this unavailability, these predictors may not be incorporated into the propensity scores used for pharmaco-epidemiological studies of outcomes associated with SGAs.[12,27] Future studies should be aware of this potential limitation and attempt to capture relevant clinical data when available or to calibrate propensity scores in a subsample to minimize the risk of residual confounding by indication. Clinical data related to metabolic and vascular risk was not significantly associated with new use of SGAs associated with weight gain though diabetes was uncommon and the study was underpowered to detect differences in variables of low prevalence. These results are nonetheless consistent with those from a larger sample not limited to bipolar disorders, suggesting metabolic parameters are not considered in SGA selection[28] according to recommendations.[7] This is particularly concerning given that individuals with bipolar disorders remain at an elevated risk for cardiovascular mortality.[29,30]

Conclusion

Based on our findings, prescription of first-line SGAs that have been associated with weight gain in bipolar and related disorders is appropriately largely driven by acuity of illness, as evidenced by inpatient setting and the presence of psychotic or manic symptoms. This data is useful to understanding the determinants of prescribing and for those developing propensity score based approaches to post-marketing surveillance studies, which should heed the role clinical presentation plays in influencing initiation of antipsychotics. Psychiatric clinicians seem to be especially influenced by clinical variables related to mental status. Future study could assess whether non-psychiatric clinicians differentially consider these clinical variables.

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References

1. Sajatovic M, Valenstein M, Blow FC, Ganoczy D, Ignacio RV. Treatment adherence with antipsychotic medications in bipolar disorder. Bipolar Disord. 2006; 8:232–41. [PubMed: 16696824]

2. Kilbourne AM, Pincus HA. Patterns of psychotropic medication use by race among veterans with bipolar disorder. Psychiatr Serv. 2006; 57:123–6. [PubMed: 16399973]

3. Lieberman JA, Stroup TS, McEvoy JP, et al. Effectiveness of antipsychotic drugs in patients with chronic schizophrenia. N Engl J Med. 2005; 353:1209–23. [PubMed: 16172203]
4. Geddes J, Freemantle N, Harrison P, Bebbington P. Atypical antipsychotics in the treatment of schizophrenia: systematic overview and meta-regression analysis. BMJ. 2000; 321:1371–6. [PubMed: 11099280]
5. Leucht S, Corves C, Arbter D, Engel RR, Li C, Davis JM. Second-generation versus first-generation antipsychotic drugs for schizophrenia: a meta-analysis. Lancet. 2009; 373:31–41. [PubMed: 19058842]
6. Patel JK, Buckley PF, Woolson S, et al. Metabolic profiles of second-generation antipsychotics in early psychosis: findings from the CAFE study. Schizophr Res. 2009; 111:9–16. [PubMed: 19398192]
7. ADA. Consensus development conference on antipsychotic drugs and obesity and diabetes. Diabetes Care. 2004; 27:596–601. [PubMed: 14747245]
8. Baptista T, Kin NM, Beaulieu S, de Baptista EA. Obesity and related metabolic abnormalities during antipsychotic drug administration: mechanisms, management and research perspectives. Pharmacopsychiatry. 2002; 35:205–19. [PubMed: 12518268]
9. Daumit GL, Goff DC, Meyer JM, et al. Antipsychotic effects on estimated 10-year coronary heart disease risk in the CATIE schizophrenia study. Schizophr Res. 2008; 105:175–87. [PubMed: 18775645]
10. Practice guideline for the treatment of patients with bipolar disorder (revision). Am J Psychiatry. 2002; 159:1–50.
11. Schneider LS, Dagerman K, Insel PS. Efficacy and adverse effects of atypical antipsychotics for dementia: meta-analysis of randomized, placebo-controlled trials. Am J Geriatr Psychiatry. 2006; 14:191–210. [PubMed: 16505124]
12. Ray WA, Chung CP, Murray KT, Hall K, Stein CM. Atypical antipsychotic drugs and the risk of sudden cardiac death. N Engl J Med. 2009; 360:225–35. [PubMed: 19144938]
13. Ray WA, Meredith S, Thapa PB, Meador KG, Hall K, Murray KT. Antipsychotics and the risk of sudden cardiac death. Arch Gen Psychiatry. 2001; 58:1161–7. [PubMed: 11735845]
14. Reilly JG, Ayis SA, Ferrier IN, Jones SJ, Thomas SH. Thioridazine and sudden unexplained death in psychiatric in-patients. Br J Psychiatry. 2002; 180:515–22. [PubMed: 12042230]
15. Straus SM, Bleumink GS, Dieleman JP, et al. Antipsychotics and the risk of sudden cardiac death. Arch Intern Med. 2004; 164:1293–7. [PubMed: 15226162]
16. Hennessy S, Bilker WB, Knauss JS, et al. Cardiac arrest and ventricular arrhythmia in patients taking antipsychotic drugs: cohort study using administrative data. Bmj. 2002; 325:1070. [PubMed: 12424166]
17. Akiskal HS, Benazzi F, Perugi G, Rihmer Z. Agitated "unipolar" depression re-conceptualized as a depressive mixed state: implications for the antidepressant-suicide controversy. J Affect Disord. 2005; 85:245–58. [PubMed: 15780694]
18. Cassano GB, Dell'Osso L, Frank E, et al. The bipolar spectrum: a clinical reality in search of diagnostic criteria and an assessment methodology. J Affect Disord. 1999; 54:319–28. [PubMed: 10467978]
19. Benazzi F. Unipolar depression with racing thoughts: a bipolar spectrum disorder? Psychiatry Clin Neurosci. 2005; 59:570–5. [PubMed: 16194260]
20. SAS [computer program]. Version 9.2. Cary: SAS Institute Inc; 2003.
21. Koehler AB, Murphree ES. A Comparison of the Akaike and Schwarz Criteria for Selecting Model Order. Journal of the Royal Statistical Society Series C (Applied Statistics). 1988; 37:187–95.
22. Geddes JR, Goodwin GM, Rendell J, et al. Lithium plus valproate combination therapy versus monotherapy for relapse prevention in bipolar I disorder (BALANCE): a randomised open-label trial. Lancet. 2010; 375:385–95. [PubMed: 20092882]
23. Goodwin GM, Bowden CL, Calabrese JR, et al. A pooled analysis of 2 placebo-controlled 18-month trials of lamotrigine and lithium maintenance in bipolar I disorder. J Clin Psychiatry. 2004; 65:432–41. [PubMed: 15096085]

24. Duffy A, Alda M, Crawford L, Milin R, Grof P. The early manifestations of bipolar disorder: a longitudinal prospective study of the offspring of bipolar parents. Bipolar Disord. 2007; 9:828–38. [PubMed: 18076532]

25. Blanco C, Laje G, Olfson M, Marcus SC, Pincus HA. Trends in the treatment of bipolar disorder by outpatient psychiatrists. Am J Psychiatry. 2002; 159:1005–10. [PubMed: 12042190]

26. Leon AC, Solomon DA, Li C, et al. Antidepressants and risks of suicide and suicide attempts: A 27-year observational study. J Clin Psychiatry. In Press.

27. Mehta S, Johnson ML, Chen H, Aparasu RR. Risk of cerebrovascular adverse events in older adults using antipsychotic agents: a propensity-matched retrospective cohort study. J Clin Psychiatry. 2010; 71:689–98. [PubMed: 20573328]

28. Morrato EH, Cuffel B, Newcomer JW, Lombardo I, Kamat S, Barron J. Metabolic risk status and second-generation antipsychotic drug selection: a retrospective study of commercially insured patients. J Clin Psychopharmacol. 2009; 29:26–32. [PubMed: 19142103]

29. Fiedorowicz JG, Solomon DA, Endicott J, et al. Manic/hypomanic symptom burden and cardiovascular mortality in bipolar disorder. Psychosom Med. 2009; 71:598–606. [PubMed: 19561163]

30. Weiner M, Warren L, Fiedorowicz JG. Cardiovascular morbidity and mortality in bipolar disorder. Ann Clin Psychiatry. 2011; 23:40–47. [PubMed: 21318195]

Table 1

Sociodemographic and clinical characteristics of sample (N=340) by incident use of second generation antipsychotics associated with weight gain.

Variable	Incident Users (N=36)	Controls (N=304)	Total Sample (N=340)
		N (%)	
Gender: Female	18 (50%)	190 (63%)	208 (61%)
Race			
White	31 (86%)	281 (92%)	312 (92%)
Black	1 (3%)	7 (2%)	8 (2%)
Asian	1 (3%)	3 (1%)	4 (1%)
Unknown	4 (15%)	5 (2%)	9 (0.3%)
Other	1 (3%)	6 (2%)	7 (2%)
Ethnicity: Hispanic or Latino	0	5 (2%)	5 (1%)
Primary Psychiatric Chart Diagnosis			
Bipolar I	10 (28%)	104 (34%)	114 (34%)
Bipolar II	5 (14%)	55 (18%)	60 (18%)
Bipolar NOS	3 (8%)	37 (12%)	40 (12%)
Major Depressive Disorder	8 (22%)	28 (9%)	36 (11%)
Schizoaffective	10 (28%)	80 (26%)	90 (26%)
Psychotropic Medications			
Lithium†	3 (8%)	79 (26%)	82 (24%)
Valproic acid derivatives	6 (17%)	46 (15%)	52 (15%)
Lamotrigine	3 (8%)	51 (17%)	54 (16%)
Carbamazepine	0	6 (2%)	6 (2%)
FGA	10 (28%)	46 (15%)	56 (16%)
SGA	13 (36%)	159 (52%)	172 (51%)
Antidepressant	17 (47%)	177 (58%)	194 (57%)
Benzodiazepine	8 (22%)	108 (36%)	116 (34%)
Clinical features			
Psychosis‡	13 (36%)	45 (15%)	58 (17%)
Mania†	5 (14%)	13 (4%)	18 (5%)
Depression	9 (25%)	57 (19%)	66 (19%)
Suicidal ideation	1 (3%)	20 (7%)	21 (6%)
Active substance abuse	6 (17%)	22 (7%)	28 (8%)
Inpatient Setting‡	14 (39%)	44 (15%)	58 (17%)
Insurance			
Public	18 (50%)	168 (55%)	186 (55%)
Private	18 (50%)	131 (43%)	149 (44%)
None	0	5 (2%)	5 (1%)
Marital Status			
Married†	4 (11%)	92 (30%)	96 (28%)
Divorced/Separated	9 (25%)	51 (17%)	60 (17%)

Variable	Incident Users (N=36)	Controls (N=304)	Total Sample (N=340)
Single	22 (61%)	149 (49%)	171 (50%)
Widow	1 (3%)	11 (4%)	12 (4%)
Unknown	0	1 (0.3%)	1 (0.3%)
Medical Diagnosis or Treatment			
Diabetes mellitus	3 (8%)	37 (12%)	40 (12%)
Hypertension	5 (14%)	72 (24%)	77 (23%)
Obesity	17 (47%)	125 (41%)	142 (48%)
		Mean (SD)	
Age	41.3 (15.5)	47.0 (15.9)	46.6 (15.9)
Weight (kg)	90.2 (25.5)	88.5 (23.2)	88.7 (23.5)
Body Mass Index (kg/m^2)	30.9 (7.5)	30.8 (8.0)	30.8 (7.9)

† $p < 0.05$

‡ $p < 0.01$

FGA = First generation antipsychotic, NOS=Not Otherwise Specified, SD = Standard deviation, SGA = Second generation antipsychotic

Table 2

Multivariate logistic regression model for factors associated with new use of second generation antipsychotics associated with weight gain in bipolar disorders.

Factors	Odds Ratio (95% C.I.)	χ^2	*p* value
Lithium use	0.2 (0.06–0.8)	5.46	*0.*02
Manic state	5.7 (1.7–19.5)	7.86	*0.005*
Married status	0.3 (0.09–0.8)	5.08	*0.02*
Psychosis	2.5 (1.2–5.5)	5.59	*0.02*

The above variables were included in the selected multivariate regression model. Additional variables considered for the model included age, diagnosis, depression, suicidal ideation, active substance abuse, white race, gender, insurance status, inpatient setting, valproic acid treatment, diagnosis or treatment for hypertension, diagnosis or treatment for diabetes, obesity, and weight/body mass index. CI = confidence interval.

The multivariate logistic regression equation was:

$$\text{logit}(p) = -2.026 - 1.570^{*}\text{Lithium} + 1.749^{*}\text{Mania} - 1.273^{*}\text{Married} + 0.935^{*}\text{Psychotic}$$

where a value of 1 indicates the presence and 0 indicates the absence of the dichotomous variable.