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Bipolar Disorder in Nursing Homes: Impact on Antipsychotic Use, Diagnosis Patterns, and New Diagnoses in People with Dementia

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Abstract

Objectives: Nursing home quality measures include the proportion of residents who receive antipsychotics. Residents with bipolar disorder are included even though antipsychotics are FDA-approved for this indication. We evaluated how including residents with bipolar disorder impacted the antipsychotic use quality measure for long-stay residents. We evaluated the agreement of Minimum Data Set (MDS) bipolar disorder diagnoses with Medicare Data, whether dementia was diagnosed before bipolar disorder, and how less specific bipolar disorder diagnoses impacted findings.

Design: Cross-sectional study

Setting: Nursing homes in Iowa

Participants: 21,955 long-stay nursing home residents in the first quarter of 2014.

Measurements: We identified antipsychotic use and bipolar disorder using MDS data. We compared MDS bipolar disorder diagnoses with Chronic Conditions Warehouse (CCW) “ever” bipolar disorder indicators, and prior year claims. We compared CCW condition onset dates to identify bipolar disorder diagnosed after dementia.

Results: The mean (S.D.) proportion receiving antipsychotics was 19.6% (11.1%) with bipolar disorder and 18.3% (10.8%) without. The positive predictive value (PPV) of MDS bipolar disorder diagnoses was 80.2% versus CCW lifetime indicators, and 74.6% versus claims. PPV decreased by 27.1% when “bipolar disorder, unspecified” and “other bipolar disorders” diagnoses were excluded. Nearly three-quarters of residents with bipolar disorder had dementia. Over half of those with dementia had dementia first per CCW records. This proportion was lower among those with more specific bipolar disorder diagnoses or MDS bipolar disorder indicators.

Conclusion: Bipolar disorder in nursing home residents is often first diagnosed after dementia using non-specific diagnoses. This practice deserves further evaluation.

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Conflicts of Interest

Dr. Carnahan has served as a consultant to the U.S. Department of Justice on issues related to medication use in nursing homes. Ms. Letuchy reports no potential conflicts of interest.

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Keywords

Bipolar Disorder; Nursing Homes; Antipsychotics; Quality Measures; Dementia; Late Onset
Bipolar Disorder

Introduction

Nursing homes certified by the Centers for Medicare and Medicaid Services (CMS) are evaluated by a Five-Star Quality Rating System. The ratings are based on information from health inspections, staffing, and quality measures. Ratings are provided on the Nursing Home Compare website to help consumers make choices. (1) CMS value-based payment systems indicate that quality measures may affect reimbursement. (2) Given their uses, an overarching concern is the extent to which quality measures truly represent quality. (3) Other concerns are whether quality measures will keep patients who negatively impact a quality measure from getting needed care, or whether providers may be unfairly penalized for providing care for those patients. (4)

The Five-Star Quality Rating System includes antipsychotic use measures for both long-stay and short-stay residents. (5) Antipsychotics are commonly used in nursing home residents with dementia to manage behavioral and psychological symptoms (BPSD), although they have limited efficacy for this purpose and significant adverse effects. (6,7) The antipsychotic use quality measures do not capture the nuances of antipsychotic appropriateness in the nursing home setting. The long-stay measure is the proportion of residents who received an antipsychotic in the seven days prior to their quarterly Minimum Data Set (MDS) assessment. Residents with schizophrenia, Tourette's syndrome, and Huntington's disease are excluded from the measure since these conditions more clearly justify antipsychotic use. (8) Exclusion conditions were modified when the antipsychotic measures began to be included on the Nursing Home Compare website in July 2012. Previous versions also excluded people with hallucinations, delusions, or bipolar disorder. (9) Removing hallucinations and delusions from the exclusions is consistent with the lack of FDA approval of antipsychotics for BPSD, even though these are sometimes considered appropriate target symptoms for antipsychotics. Removing bipolar disorder is different, since many antipsychotics are FDA-approved for use in bipolar disorder. (10) Thus, it is difficult on its face to discern how antipsychotic use in bipolar disorder would reflect worse quality. This is relevant given the growing prevalence of serious mental illness among nursing home residents and variation in rates across facilities. An estimated 6.4% had had bipolar disorder or schizophrenia per the MDS in 2000 compared to 8.3% in 2008, and rates were much higher in many facilities. (11) The removal of bipolar disorder as an exclusion criterion was the impetus for this study.

The primary goal of this study was to evaluate the impact of including nursing home residents with bipolar disorder in the nursing home quality measure: percentage of long-stay residents receiving antipsychotic medication. (9) We expected that facilities with a large proportion of residents with mental health conditions would be disproportionately negatively impacted by including residents with bipolar disorder.

A second goal was to explore what the MDS indicator for bipolar disorder represents in terms of diagnoses. Although we are not aware of published justification for including people with bipolar disorder in the quality measure, one plausible explanation is concern that quality measures might be gamed by diagnosing people with dementia symptoms with bipolar disorder. Relatedly, the observance of new diagnoses of schizophrenia in long-term care residents with dementia who were receiving antipsychotic medications recently led stakeholder groups, including the American Association for Geriatric Psychiatry (AAGP), to issue a statement about diagnosing schizophrenia and cautioning against using other diagnoses to justify antipsychotic use in dementia. Bipolar disorder diagnoses could similarly be used to justify antipsychotic use in dementia. (12,13) Also, bipolar type VI has been proposed as a diagnosis to represent symptoms of bipolar disorder arising in late-life in various contexts, including in dementia. (14) Regardless of diagnostic labels, mood symptoms in dementia almost certainly represent a different condition than bipolar disorder with an onset earlier in life. As such, the evidence that led to FDA-approval of antipsychotics for bipolar disorder cannot be generalized to patients developing symptoms in the context of dementia. There is thus little justification for considering these patients differently than others with dementia in quality measures. To explore what the MDS bipolar disorder indicator represents, we evaluated its agreement with the Medicare Chronic Conditions Warehouse (CCW) indicator for bipolar disorder, and whether dementia was present before bipolar disorder according to CCW records. (15) We also evaluated the agreement of bipolar disorder diagnoses between the MDS and claims data, and whether dementia was present before bipolar disorder for people with different subsets of diagnosis codes.

Methods

Study Population

This study included long-stay residents of nursing homes in the State of Iowa in the first quarter of 2014, with a current stay greater than 100 days. Consistent with the quality measure, we excluded residents with a MDS indicator for schizophrenia, Tourette's disorder, or Huntington's disease. (8,9) In analyses to evaluate recent bipolar disorder diagnoses among those with bipolar disorder per the MDS, those with one year of continuous fee-for-service Medicare eligibility prior to the MDS assessment were included. Sensitivity analyses also evaluated a sample with two years of continuous prior eligibility. This project was approved by the University of Iowa Institutional Review Board.

Data Sources

We used MDS, Medicare, and CCW beneficiary summary file data from 2012 to 2014 to characterize residents and quality measures. We used Certification and Survey Provider Enhanced Reporting (CASPER) system data to evaluate nursing home characteristics, which were based on the survey record closest in time to January 1, 2014.

Measures

Nursing home characteristics were evaluated using CASPER data, including facility size, staffing measures, and the census and proportions of residents with various diagnoses and medications related to mental and cognitive health.

The percentage of long-stay residents receiving antipsychotics in the first quarter of 2014 was calculated for each nursing home using the method described in the MDS 3.0 Quality Measures User's Manual. (8) This was also calculated after excluding people with bipolar disorder according to the MDS record used. This was based on item I5900, which indicates an active diagnosis of "Manic Depression (bipolar disease)."

Bipolar disorder diagnoses on the MDS were compared with several reference standards to evaluate their validity and performance characteristics. The CCW chronic conditions indicator for bipolar disorder was used as a reference standard in all subjects, since this does not depend on observing recent claims. This requires a bipolar disorder diagnosis on an inpatient claim or at least two outpatient claims within a two-year period. CCW provides the first date since 1999 that an individual met these criteria. Claims data were also used for reference standards. The primary analysis used claims from 1 year prior to the MDS target date among those with continuous eligibility for fee-for-service Medicare benefits during this time period.

We determined whether residents had received a diagnosis within the CCW bipolar disorder definition during each time period. We also determined how the exclusion of specific subsets of diagnoses impacted performance, using two lists of diagnoses that differed from the CCW list. "List 1" was consistent with the CCW codes except that it excluded ICD-9-CM codes 296.82 (atypical depressive disorder), 296.90 (unspecified episodic mood disorder), and 296.99 (other specified episodic mood disorder) since these are not specific to bipolar disorder. "List 2," excluded these codes as well as ICD-9-CM codes 286.80 (bipolar disorder, unspecified) and 286.89 (other bipolar disorders) with the expectation that they are more likely to represent a bipolar type VI or similar diagnosis compared to other codes. There is no ICD-9-CM diagnosis code for bipolar type VI, or bipolarity in dementia. These codes and definitions are in Supplementary Table S1. The proportion of residents meeting criteria for each definition who received antipsychotics per MDS records was also calculated.

Among residents with both dementia and bipolar disorder according to the CCW indicators, we evaluated whether the first dementia diagnosis occurred prior to meeting criteria for bipolar disorder. This pattern suggests that the bipolar disorder diagnosis may represent mood symptoms in dementia. Dementia was based on the "Alzheimer's disease and related disorders or senile dementias" indicator, which requires a single eligible diagnosis (Supplementary Table S2). This provides the date of the first dementia diagnosis since 1999 in Medicare data. We repeated this analysis in subgroups of residents with a claim for bipolar disorder in the various evaluation periods, using the full CCW diagnosis list, as well as List 1 and List 2. We hypothesized that residents with dementia before bipolar disorder would more often have only non-specific bipolar disorder diagnoses, such as "bipolar disorder, unspecified" or "other bipolar disorders."

Statistical Analysis

The long-stay antipsychotic use quality measure was calculated for all facilities with and without people with a bipolar disorder diagnosis on the relevant MDS record. The change was the antipsychotic use rate when residents with bipolar disorder were excluded minus the rate when they were included. The significance of these changes was evaluated using a Wilcoxon signed-rank test. Relative changes in rates were also calculated for those facilities without a zero rate when bipolar disorder was excluded, as the percent absolute change when including people with bipolar disorder diagnoses divided by the rate when they were excluded. Characteristics of nursing homes with changes in antipsychotic use rates in the 90th percentile or above were compared to those below the 90th percentile using chi-square tests and Mann-Whitney U tests as appropriate (normal approximation with continuity correction results were reported).

In comparing the MDS bipolar disorder indicator to Medicare sources, Medicare sources were considered the reference standards. We calculated positive predictive value (PPV), sensitivity, and kappa of the MDS diagnosis compared to CCW and claims-based definitions of bipolar disorder. PPV indicates how often MDS diagnoses are supported by claims, sensitivity suggests how often claim-based diagnoses are recognized by nursing home providers, and kappa provides a measure of overall agreement of sources. Antipsychotic use rates per MDS records were calculated for those meeting each bipolar disorder definition. Two sensitivity analyses were conducted to determine the impact of the claims evaluation period. One evaluated claims in the 2 years prior to the MDS target date, among those continuously eligible for this time period. Among those with 1 year of continuous prior eligibility, another sensitivity analysis allowed a bipolar disorder diagnosis to have occurred later in 2014, after the MDS record on which bipolar disorder was recorded.

Among those with CCW chronic conditions indicators for ever having had both bipolar disorder and dementia, we determined the proportion of patients in whom the dementia diagnosis occurred first according to CMS records by comparing the dates. Additional analyses evaluated how this proportion varied among subgroups with bipolar disorder diagnoses on Medicare claims in 2013 or 2014, using different subsets of bipolar diagnoses.

We evaluated the proportion of residents who were diagnosed with both dementia and bipolar disorder when they were younger than 67 to help ensure that the pattern was not an artifact of having both when first eligible for Medicare at age 65, since bipolar disorder requires an inpatient or two outpatient diagnoses, while dementia only requires one. We also evaluated the proportion in which both were present prior to 2001, since CCW indicators use data going back to 1999. Finally, we compared the prevalence of MDS-documented BPSD and psychotropic medication use between those diagnosed with bipolar disorder before versus after dementia using chi-square tests.

Results

The evaluation of the antipsychotic quality measure included 437 nursing homes. Of 22,992 long-stay residents, 1,020 had exclusion diagnoses. Seventeen were excluded due to missing values for antipsychotic use. For the 21,955 included residents, the mean (S.D.) age was

83.4 (12.0), 70.1% were female, and 2.56% had bipolar disorder according to the MDS record. The mean (S.D.) proportion receiving antipsychotics was 19.6% (11.1%) when residents with bipolar disorder were included and 18.3% (10.8%) when they were excluded (Wilcoxon signed-rank test, $S=14,327.5$, number of non-0 differences=256, $p<0.0001$). Differences in these proportions with versus without residents with bipolar disorder had a mean (S.D.) of 1.3%, and a range of -1.5% to 13.9% . This was a skewed distribution. The proportion was unchanged or smaller for over half of facilities. The 90th percentile of change was 3.9%. This cutoff was used to classify nursing homes into groups for comparison (nursing homes above the 90th percentile will be referred to as “highly impacted”). The mean (S.D.) relative changes in antipsychotic use rates were 28.2% (18.8%) for the 43 highly impacted facilities and 4.7% (9.0%) for 388 other facilities with non-zero rates when excluding bipolar disorder.

Table 1 provides comparisons of proportions of residents with certain characteristics in highly impacted facilities versus other facilities, based on CASPER data. Highly impacted facilities had higher proportions of residents with psychiatric diagnoses, bipolar disorder, and receiving psychoactive medications, antipsychotics, antianxiety medications, and antidepressants. They had smaller proportions of residents on a pain management program. There were no differences in staffing variables, including hours per resident bed of mental health services (Table 2). Based on MDS records, the median (interquartile range) proportion of residents with bipolar disorder was 7.7% (6.7%–9.7%) in highly impacted facilities and 1.3% (0%–3.1%) in other facilities (Mann-Whitney U test normal approximation with continuity correction, $Z=10.48$, $p<0.0001$).

Table 3 illustrates the PPV, sensitivity, and kappa of the bipolar disorder indicator on the MDS when compared with several reference standards, among subjects with 1 year of prior continuous fee-for-service Medicare eligibility ($N=15,670$). It also provides antipsychotic use rates among those meeting each bipolar disorder definition, which ranged from 61.1% to 70.4%. Using a CCW bipolar disorder first date prior to the MDS target date as the reference standard, the positive predictive value (PPV) of an MDS diagnosis was 80.2%. The sensitivity was only 44.7% and kappa was 0.559. The PPV was 74.6%, sensitivity 43.2%, and kappa 0.531 when the reference standard was the presence of a claim in the prior year with a bipolar disorder diagnosis code used in the CCW indicator. Kappa values of 0.41 to 0.60 are considered moderate agreement. (16)

The PPV was 71.5% and sensitivity 67.5% when excluding diagnosis codes for “atypical depressive disorder,” “unspecified episodic mood disorder,” and “other specified episodic mood disorder” from the reference standard. Kappa was 0.686. This was the only diagnosis list with substantial agreement. (16) PPV was 44.4% when codes for “bipolar disorder, unspecified,” and “other bipolar disorder” were excluded from the reference standard, indicating that these were often the only diagnoses supporting MDS diagnoses. Sensitivity was 72.8% and kappa was 0.542. Results were similar in sensitivity analyses (Supplementary Tables S3 and S4). The highest PPV for the MDS indicator was 82.0%, when CCW indicators with first diagnoses after the MDS date were included in the reference standard.

Among 928 residents in the quality measure analysis with a CCW lifetime indicator for bipolar disorder, 683 (73.6%) also had a CCW indicator for dementia. Table 4 illustrates the proportion of residents with both dementia and bipolar disorder who had dementia before bipolar according to CCW records, using different bipolar disorder definitions. The proportion with dementia before bipolar disorder trended downward as more specific definitions of bipolar disorder were used, ranging from 57.5% to 31.7% in all residents and 34.3% to 23.3% in those with bipolar disorder per the MDS. The results indicate that about half of those whose only bipolar disorder diagnoses in 2013 and 2014 were for “bipolar disorder, unspecified” or “other bipolar disorder” had dementia before bipolar disorder, regardless of whether they had bipolar disorder per the MDS.

Most cases of dementia before bipolar disorder did not appear to be artifacts of CCW methods. Among the 393 residents with dementia before bipolar disorder per CCW records, 63 (16.0%) had both dementia and bipolar disorder before age 67. Only 4 (1.0%) had the onset of both before the year 2000. Per CCW records for this subgroup, the mean (S.D.) age of onset of dementia was 74.1 (10.8) years and the mean (S.D.) age of onset of bipolar disorder was 77.7 (10.6) years. The median (interquartile range) time from dementia diagnosis to meeting bipolar disorder criteria was 3.5 (0.8, 5.2) years.

Table 5 shows comparisons of symptoms and psychotropic medication use between those diagnosed with bipolar disorder before versus after dementia. Physical behavioral symptoms directed toward others, rejection of care, and wandering were more common among those diagnosed with bipolar disorder after dementia, while other symptoms and psychotropic medication use were similar between groups.

Discussion

This study produced several provocative results relating to the use of bipolar disorder diagnoses in nursing home residents. It provides some context for the inclusion of people with bipolar disorder diagnoses in antipsychotic use quality measures for nursing homes. As anticipated, highly impacted nursing homes had larger proportions of residents with psychiatric diagnoses and receiving various psychotropic drugs. This suggests that this change in the quality measure exclusion criteria has a greater negative impact on the quality measures of nursing homes that accept more patients with chronic mental health conditions compared to those that accept fewer. However, these findings are affected by the way in which bipolar disorder is diagnosed and documented on the MDS, and the accuracy of both appears questionable. The lack of differences in mental health services staffing also does not suggest that highly impacted facilities provided more mental health-specific care.

The evaluation of bipolar disorder diagnoses raises questions about the validity of some of these diagnoses, and whether they justify antipsychotic use. PPV of an MDS bipolar disorder diagnosis never exceeded 82% with any Medicare-based reference standard. Over two-thirds of the long-stay residents with an MDS bipolar disorder diagnosis also had a dementia diagnosis. In 57.5% of those the dementia diagnosis came before the CCW bipolar disorder criteria were met. This indicates that 42% of residents with a bipolar disorder diagnosis were diagnosed with dementia first. If these represent mood disorder symptoms in

the context of dementia, there is no clear reason to consider these differently than other BPSD for quality measures.

Bipolar disorder was not recorded on MDS records of many residents with bipolar disorder per Medicare claims or CCW indicators. This is not concerning in relation to using a bipolar disorder diagnosis to justify antipsychotic use. However, it suggests that bipolar disorder is not being considered in care planning, which the MDS is meant to support. (17) Symptoms could be overlooked or misinterpreted because of lack of knowledge about the resident's history. This may be due in part to the CCW definition being overly inclusive of diagnoses, but a quarter of cases were still missed on the MDS among those with a more specific bipolar disorder diagnosis within the last year. Prior work in Ontario hospital-based long-term care found the sensitivity of the MDS bipolar disorder indicator was 77%, only slightly higher than that estimated in our study. (18)

Over a quarter of bipolar disorder diagnoses in the MDS were based on "bipolar disorder, unspecified" and "other bipolar disorder" diagnoses. Using one year of prior claims, the PPV of MDS diagnoses dropped from 71.5% to 44.4% when these two codes were excluded. It is possible that these diagnoses represent bipolar disorder type II, which has no specific ICD-9 code, but they may represent BPSD.

The proportion of residents with dementia before bipolar disorder per CCW records was higher when including those with less specific diagnoses in claims, indicating that many residents in whom dementia was diagnosed first received only non-specific bipolar disorder diagnoses. Psychotropic drug use measures were similar regardless of whether dementia was diagnosed first, while those with bipolar disorder diagnosed after dementia had a higher prevalence of some BPSD. This appears consistent with the hypothesis that bipolar disorder diagnoses might in some cases be used to justify antipsychotic use for BPSD.

In light of these results, we can understand the CMS decision not to exclude people with bipolar disorder from the antipsychotic use quality measures for nursing homes. The results do not rule out negative effects on facilities that care for patients with bipolar disorder, or on those patients if nursing homes do not accept them because they need antipsychotics. However, the patterns of bipolar disorder diagnoses relative to dementia diagnoses suggest that a meaningful proportion might represent symptoms related to dementia. Using bipolar disorder as an exclusion criterion would reintroduce the possibility that providers could use this diagnosis to justify antipsychotic use in dementia. CMS should discuss these issues with specialty groups like AAGP to gain insights into the impact of their decision.

This study is limited by the use of administrative data for one state, and needs replication. Future work could evaluate treatment patterns in people diagnosed with bipolar disorder after dementia, particularly patterns of psychotropic drug use and care from psychiatrists. This type of evaluation could also be extended to other diagnoses that exclude people from quality measures, such as schizophrenia.

We believe the most important contribution of this study may be to stimulate debate among experts in geriatric psychiatry about the use bipolar disorder diagnoses in people with dementia, and the extent to which they justify different approaches to drug therapy. If bipolar

disorder arising within dementia is truly a unique syndrome, then it would be useful to evaluate drug therapies in this subgroup of patients to determine if their effectiveness and safety differs from what has been established in dementia.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1:

Comparison of Mental Status and Medication Census Data by Change in the Antipsychotic Quality Measure when Residents with Bipolar Disorder were Excluded (<90th vs. ≥90th percentile of change)

Characteristic	<90 percentile N=393		≥90 percentile N=43		P-value ^a
	Mean (S.D.)	Proportion of Resident Census Count	Mean (S.D.)	Proportion of Resident Census Count	
Depression	0.529	(0.210)	0.542	(0.220)	0.9522
Psychiatric diagnosis	0.252	(0.175)	0.419	(0.197)	<0.0001
Dementia	0.476	(0.160)	0.438	(0.182)	0.0961
Behavioral symptoms	0.236	(0.172)	0.281	(0.188)	0.1049
Behavioral management program	0.114	(0.166)	0.165	(0.199)	0.1200
Pain management Program	0.630	(0.166)	0.553	(0.165)	0.0020
Psychoactive medication	0.651	(0.116)	0.701	(0.128)	0.0099
Antipsychotic medication	0.195	(0.108)	0.303	(0.157)	<0.0001
Antianxiety medication	0.227	(0.100)	0.277	(0.128)	0.0069
Antidepressant medication	0.534	(0.117)	0.582	(0.110)	0.0143
Hypnotic medication	0.030	(0.039)	0.043	(0.078)	0.6603

^aP-values are for Mann-Whitney U test normal approximation (with continuity correction)

Table 2:

Comparison of Nursing Home Staffing by Change in the Antipsychotic Quality Measure when Residents with Bipolar Disorder are Excluded (<90th vs. ≥90th percentile of change)

	<90 percentile N=393		≥90 percentile N=43	
Staff Type	Mean (S.D) hours per resident bed		Mean (S.D.) hours per resident bed	P-value^a
Medical Director	0.035 (0.079)		0.057 (0.151)	0.8116
RN Director of Nursing	0.97 (0.49)		1.03 (0.58)	0.3945
Registered Nurse	4.10 (4.96)		3.78 (1.66)	0.7786
LPN/LVN	4.94 (2.05)		5.18 (3.31)	0.8739
Certified Nurse Aides	16.92 (6.99)		17.39 (5.68)	0.6587
Therapeutic Recreational Specialty	0.066 (0.400)		0.030 (0.107)	0.4240
Activity Professional	0.79 (0.51)		0.80 (0.46)	0.9898
Activity Staff Other	0.74 (0.95)		0.47 (0.50)	0.0441
Mental Health Services	0.021 (0.073)		0.027 (0.075)	0.6576

^aP-values are for Mann-Whitney U test normal approximation (with continuity correction)

Table 3:

Positive Predictive Value, Sensitivity, and Kappa of the Minimum Data Set Bipolar Disorder Indicator Compared to Different Reference Standards, and Use of Antipsychotics Per the MDS, in Residents with 1 Year of Continuous Fee-for-Service Medicare Eligibility Prior to the Target Date^a (N=15,670)

Reference Standard	PPV (95% CI) (TP/(TP + FP))	Sensitivity (95% CI) (TP/(TP + FN))	Kappa	Received Antipsychotics ^b % (95% CI) (n/N)
CCW ever bipolar disorder indicator	80.2% (76.1%, 84.0%) (329/410)	44.7% (41.1%, 48.4%) (329/736)	0.559	62.8% (59.2%, 66.3%) (462/736)
CCW definition bipolar disorder diagnosis	74.6% (70.1%, 78.8%) (306/410)	43.2% (39.5%, 46.9%) (306/709)	0.531	61.1% (57.4%, 64.7%) (433/709)
List 1 bipolar disorder diagnosis ^c	71.5% (66.8%, 75.8%) (293/410)	67.5% (62.9%, 71.9%) (293/434)	0.686	68.2% (63.6%, 72.6%) (296/434)
List 2 bipolar disorder diagnosis ^d	44.4% (39.5%, 49.3%) (182/410)	72.8% (66.8%, 78.2%) (182/250)	0.542	70.4% (64.3%, 76.0%) (176/250)

^aThe criteria for the Chronic Conditions Warehouse (CCW) ever bipolar disorder indicator were required to be met by the target date of the Minimum Data Set assessment. Claims-based definitions use diagnoses from medical care encounters in the year prior to the target date of the assessment.

^bAmong the 410 with a MDS bipolar disorder diagnosis, 278/410 (67.8% (95% CI 63.0%, 72.3%)) received antipsychotics.

^cList 1 diagnoses include all CCW definition diagnoses, except for "atypical depressive disorder," "unspecified episodic mood disorder," and "other specified episodic mood disorder." See Supplemental Table S1 for a complete list.

^dList 2 diagnoses include all List 1 diagnoses, except for "bipolar disorder, unspecified," and "other bipolar disorders." See Supplemental Table S1 for a complete list.

Abbreviations: PPV=positive predictive value, TP=true positives, FP=false positives, FN=false negatives, CCW=Chronic Conditions Warehouse

Table 4:

Proportion of Residents with Dementia and Bipolar Disorder According to Different Definitions^a who had Dementia before Bipolar Disorder per Medicare Chronic Conditions Warehouse (CCW) Records

Definition ^a	Bipolar disorder per the definition		Bipolar disorder per the definition and the MDS	
	N	N (% (95% CI)) with dementia before bipolar Disorder	N	N (% (95% CI)) with dementia before bipolar disorder
CCW ever bipolar disorder indicator	683	393 (57.5% (53.7%, 61.3%))	265	91 (34.3% (28.6%, 40.4%))
CCW definition bipolar disorder diagnosis	581	322 (55.4% (51.3%, 59.5%))	252	82 (32.5% (26.8%, 38.7%))
List 1 bipolar disorder diagnosis ^b	362	151 (41.7% (36.6%, 47.0%))	245	78 (31.8% (26.1%, 38.1%))
List 2 bipolar disorder diagnosis ^c	224	71 (31.7% (25.7%, 38.2%))	159	37 (23.3% (16.9%, 30.6%))

^a Claims-based definitions were based on all diagnoses from Medicare-billed encounters in 2013 and 2014. Dementia was based on the CCW “ever” indicator.

^b List 1 diagnoses include all CCW definition diagnoses, except for “atypical depressive disorder,” “unspecified episodic mood disorder,” and “other specified episodic mood disorder.” See Appendix Table 1 for a complete list.

^c List 2 diagnoses include all List 1 diagnoses, except for “bipolar disorder, unspecified,” and “other bipolar disorders.” See Appendix Table 1 for a complete list.

Abbreviations: CCW=Chronic Conditions Warehouse

Table 5:

Behavioral and Psychological Symptoms among Residents with Dementia and Bipolar Disorder per CCW Criteria, Classified by Order of Meeting Criteria

Characteristic ^a	Bipolar disorder before dementia (N=290) N (%)	Bipolar disorder after dementia (N=393) N (%)	Chi-square test p-value ^b
Symptoms/Behaviors			
Hallucinations	8 (2.8%)	19 (4.8%)	0.1687
Delusions	41 (14.1%)	76 (19.3%)	0.0746
Physical behavioral symptoms directed toward others	25 (8.6%)	58 (14.8%)	0.0152
Verbal behavioral symptoms directed toward others	49 (16.9%)	86 (21.9%)	0.1058
Other behavioral symptoms not directed toward others	45 (15.5%)	64 (16.3%)	0.7865
Rejection of care	42 (14.5%)	84 (21.4%)	0.0217
Wandering	15 (5.2%)	41 (10.4%)	0.0133
Drugs in previous week			
Antipsychotic	187 (64.5%)	242 (61.6%)	0.4375
Antianxiety	105 (36.2%)	153 (38.9%)	0.4679
Antidepressant	211 (72.8%)	296 (75.3%)	0.4497
Hypnotic	15 (5.2%)	14 (3.6%)	0.3023

^aAccording to the MDS assessment used to calculate the quality measure, or the most recent MDS assessment in the previous 6 months if the documentation was missing.

^bAll chi-square tests had one degree of freedom.