Methodology Report

Medication Continuation Following Inpatient Psychiatric Discharge - Version 1.0

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Executive Summary

Background

The Centers for Medicare & Medicaid Services (CMS) has contracted with Health Services Advisory Group, Inc. (HSAG) to develop a process measure to assess facility-level rates of medication continuation following psychiatric discharges from inpatient psychiatric facilities (IPFs). This report describes the basis for the measure, provides the analytic methodology, outlines the results of the data analysis, and includes the measure specifications.

The measure, *Medication Continuation Following Inpatient Psychiatric Discharge*, focuses specifically on patients admitted for major depressive disorder (MDD), schizophrenia, and bipolar disorder because pharmacotherapy is the primary form of treatment for most patients discharged from IPFs with those conditions. Continuation of medications post-discharge is important to measure because evidence exists to support the association between medication compliance and improved patient outcomes.[1,2]

In examining this issue, HSAG identified gaps in the continuity of care in pharmaceutical treatment during the transition of patients from inpatient care to outpatient care using 2013–2014 Medicare claims data. Across 1,694 IPFs, the median rate of medication continuation was 80% with a range of 67% in the 10th percentile to 88% in the 90th percentile. These data show a wide variation in performance and indicate ample opportunity for improvement. Furthermore, studies have identified processes IPFs can implement to improve medication continuation as patients move from inpatient to outpatient care. Interventions that have been shown to increase medication compliance and prevent negative outcomes associated with nonadherence include patient education, enhanced therapeutic relationships, shared decision-making, and text-message reminders, with emphasis on multidimensional approaches.[3-13]

Measure Overview

This measure uses Medicare fee-for-service (FFS) claims to identify whether patients admitted to IPFs with diagnoses of MDD, schizophrenia, or bipolar disorder had at least one prescription filled for an evidence-based medication during the follow-up period (2 days prior to discharge through 30 days post-discharge). Evidence-based medications for this measure refer to medications that are recommended by the American Psychiatric Association (APA) and the Department of Veterans Affairs/Department of Defense (VA/DoD) clinical practice guidelines or that have literature to support their use for effective treatment of a given condition. Facility-level medication continuation measure scores are calculated by dividing each facility's discharges with at least one claim for an evidence-based medication (numerator) by its eligible discharges (denominator).

The denominator includes IPF stays for all patients discharged alive with a principal diagnosis of MDD, schizophrenia, or bipolar disorder who were at least 18 years of age at admission, enrolled in Medicare FFS during the index admission and follow-up period, and discharged to home or home health care. The measure excludes discharges for patients who may not fill a prescription for an evidence-based medication during the follow-up period for the following reasons: they receive alternative therapies during the inpatient stay or follow-up period, are pregnant during the inpatient stay, or have other contraindications for pharmacotherapy.

The measure counts claims for evidence-based medications toward the numerator if they are filled during the follow-up period. Measure scores are reported as a single proportion across all three conditions and are based on two years of data. We determined that the measure score is highly reliable using signal-to-noise analysis with a minimum of 75 discharges in the denominator. Furthermore, measure validity testing at both the measure score level and data element level confirmed that the measure is valid as specified. At the measure score level, comparisons were made to conceptually related measures, which identified statistically significant correlations.

The data element level testing (comparing claims data to chart abstracted data as the gold standard) indicated high positive predictive values for elements assessed.

Conclusion

This measure provides reliable and valid facility-level rates of medication continuation following discharge from IPFs for MDD, schizophrenia, and bipolar disorder. Continuation of medications in these patient populations is critical for management of symptoms and better health outcomes, yet current facility-level measure scores indicate clear quality gaps in the continuity of care in pharmaceutical treatment as patients transition from inpatient to outpatient care. By calculating the facility-level rates of medication continuation in Medicare FFS claims data, CMS aims to encourage quality improvement, specifically relating to stronger care transitions to outpatient settings. This measure can provide valuable information to providers on areas where care transitions to the outpatient setting can be improved. We envision the addition of this measure to the suite of measures for IPFs will help to create a comprehensive picture of the quality of care patients receive at those facilities.

1. Introduction

The Centers for Medicare & Medicaid Services (CMS) has contracted with Health Services Advisory Group, Inc. (HSAG) to develop, maintain, reevaluate, and support the implementation of quality process and outcome measures for the CMS Inpatient Psychiatric Facility Quality Reporting (IPFQR) Program. As part of this contract, HSAG developed a process measure, *Medication Continuation Following Inpatient Psychiatric Discharge*, to assess facility-level measure scores of medication continuation among patients with psychiatric illness following discharges from inpatient psychiatric facilities (IPFs) for mental illness. The measure focuses specifically on patients admitted for major depressive disorder (MDD), schizophrenia, and bipolar disorder because pharmacotherapy is the primary form of treatment for most patients discharged from an IPF with those conditions.

This report describes the basis for the measure, provides the analytic methodology, outlines the results of the data analysis, and includes the measure specifications. In Section 1, we introduce literature that supports the measure focus and discuss the impact of implementing the measure. In Section 2, we provide detail on the methodology for the development and testing of the measure. In Section 3, we present the descriptive statistics and results of measure testing. The report concludes with our final assessment of the measure and the final measure specifications in Sections 4 and 5, respectively. A list of acronyms and abbreviations used in this document is included in Appendix 1.

1.1 Background

Use of medications post-discharge is important to measure because evidence exists to support the association between medication continuation and better patient outcomes.[1,2] For patients with MDD, an extensive body of evidence has shown that antidepressant medications are efficacious in acute treatment and maintenance treatment for reducing depressive symptoms and prevention of relapse. The continued use of effective medication among patients with depression is supported by a 2010 meta-analysis of 54 double-blind placebo-controlled relapse prevention studies that found, among patients who initially responded to drug therapy, continuation of antidepressants significantly reduced relapse (odds ratio [OR] 0.35; 95% confidence interval [CI] 0.32–0.39), and this reduction was not affected by patient age, drug class, depression subtype, or treatment duration.[14] Despite the benefits of medication continuation, only 13% of patients fill their first prescription for antidepressant medications,[15] and further research estimated non-adherence to antidepressants ranged from 40% to 53% in a population of patients with recurrent depression.[16] Patients with MDD who did not remain on prescribed medications were more likely to have negative health outcomes, such as relapse and readmission, decreased quality of life, and increased healthcare costs. If untreated, MDD could contribute to or worsen chronic medical disorders.[14,17] Based on the findings of these and similar studies, guidelines from the American Psychiatric Association (APA) and the Department of Veterans Affairs/Department of Defense (VA/DoD) recommend the use of pharmacotherapy for patients with severe depression.[18,19]

For patients with schizophrenia, a large body of literature has shown that antipsychotic medications reduce psychotic symptoms. Patients with schizophrenia who were "good compliers," according to the Medication Adherence Rating Scale, had better outcomes in terms of rehospitalization rates and medication maintenance.[20] However, adherence rates to antipsychotic medications have been reported at 24% in a sample of patients with schizophrenia.[21] Compared to those who adhered to their medication regimen, patients with schizophrenia who did not adhere were 1.55 times more likely to be hospitalized (95% CI 1.21–1.98), 1.49 times more likely to use emergency psychiatric services (95% CI 1.12–1.98), 2.22 times more likely to be arrested (95% CI 1.53–3.24), 1.82 times more likely to be victims of crimes (95% CI 1.42–2.34), and 1.36 times more likely to consume alcohol or drugs (95% CI 1.07–1.72). Non-adherent patients had a significantly greater severity of alcohol-related problems.[22] The APA clinical practice guidelines emphasize the importance of continuing treatment during the post-acute phase because medication non-adherence is one of the most common contributors to symptom relapse.[23]

Similar to the guidelines for MDD, the APA and VA/DoD clinical practice guidelines recommend the use of pharmacotherapy for patients with bipolar disorder.[24,25] For these patients, continuing medication treatment is strongly advised to avoid the reemergence of significant symptoms, reduce risk for rehospitalization, and prevent suicide.[25] Gonzalez-Pinto et al. found that medication adherence was significantly associated with reduction in manic symptoms, while non-adherence was associated with increased suicide risk (OR 10.8, 95% CI 1.57–74.4).[26] Despite the efficacy of medications, 20% to 60% of patients do not adhere to pharmacotherapy.[27-30] In one study, up to 50% of patients with bipolar disorder failed to take prescribed mood stabilizers at least once during a one-year period.[27] More recent research showed that 69% of patients with bipolar disorder were non-compliant with pharmacotherapy.[31]

1.2 Measure Impact

There are nearly 250,000 Medicare fee-for-service (FFS) discharges from IPFs each year for patients with principal diagnoses of MDD, schizophrenia, or bipolar disorder. This measure addresses gaps in the continuity of care that exist in pharmaceutical treatment during the transition of patients with these diagnoses from inpatient care to outpatient care by measuring whether the patients were dispensed an evidence-based medication during the follow-up period (2 days prior to discharge through 30 days post-discharge from IPFs). To explore the current performance of IPFs related to this measure, HSAG conducted empirical analyses using 2013–2014 Medicare claims data. The analyses found that the median rate of medication continuation across 1,694 IPFs was 80% with a range of 67% in the 10th percentile to 88% in the 90th percentile. These data indicate a wide variation in performance and ample opportunity for improvement.

IPFs can use the information provided by this measure to identify quality deficits and implement interventions to improve medication continuation rates. Interventions that have been shown to increase medication compliance and prevent negative outcomes associated with nonadherence include patient education, enhanced therapeutic relationships, shared decision-making, and text-message reminders, with emphasis on multidimensional approaches.[3-13]

If all facilities had at least the 2013–2014 median rate of medication continuation, we estimate that more than 16,000 additional Medicare FFS discharges would be followed by patients filling prescriptions for an evidence-based medication to manage their condition. In addition to improving patient outcomes, implementation of this measure and associated quality improvement interventions could translate to substantial savings to Medicare. In a review of the literature, including seven studies of Medicaid patients with schizophrenia, national rehospitalization costs related to antipsychotic nonadherence totaled $1.5 billion in 2005.[32] Although direct medical costs for discontinuation of medication are not available for Medicare patients with MDD, schizophrenia, and bipolar disorder after IPF discharge, we would expect to see similar savings for these patients.

On a broad scale, implementation of this measure would help CMS achieve CMS Quality Strategy goals.[33] The measure supports the three objectives of Goal 3 – Promote Effective Communication and Coordination of Care: reduce admissions and readmissions, embed best practices to enable successful transitions between all settings of care, and enable effective healthcare system navigation. The measure also directly aligns with one of the objectives of Goal 4 – Promote Effective Prevention and Treatment of Chronic Disease: improve behavioral health access and quality of care by using evidence-based practices and ensuring treatment starts within 30 days of diagnosis of a behavioral health condition.

2. Methods

Medication Continuation Following Inpatient Psychiatric Discharge is a process measure that uses Medicare administrative claims data to calculate the rate of evidence-based medication fills during a follow-up period that spans the 2 days prior to discharge through 30 days post-discharge from an IPF for a diagnosis of MDD, schizophrenia, or bipolar disorder. The Methods section of the report describes the approach to defining the measure, calculating the facility-level measure scores, and testing the reliability and validity of the data elements and measure score. For the tables, all percentages are rounded to the first decimal place and abbreviations are included in Appendix 1.

2.1 Data Sources

2.1.2 Measure Testing

The measure was developed and tested using Medicare files for all IPF discharges that occurred between January 1, 2013 and December 31, 2014. The data include 380,861 discharges from 1,694 IPFs across the United States. IPFs ranged in size from 4 to 771 inpatient beds. Roughly 70% of IPFs in this dataset were units within a larger hospital (Table 1). The average number of discharges per freestanding IPF was roughly 300, and the average per IPF unit was roughly 200.

Table 1. Distribution of Discharges by IPF Type (January 1, 2013 – December 31, 2014)

IPF Type	IPFs (N=1,694)	Mean	SD	Min	10th Pctl	Lower Quartile	Median	Upper Quartile	90th Pctl	Max
Freestanding	515	301.8	322.9	1	20	77	184	416	779	1,760
Unit	1,179	191.2	189.9	1	24	56	135	263	419	1,320
Overall	1,694	224.8	243.6	1	23	60	148	293	529	1,760

To inform the preliminary measure specifications, we conducted alpha testing, which consisted of a medical record review in two IPFs at a large academic medical center in the southeast U.S. Medical records for 166 discharges were abstracted by two clinicians to inform the numerator definitions and the exclusion criteria.

To evaluate the validity of key elements in the claims data, we conducted similar medical record abstractions in seven additional IPFs. Test sites varied in size, type, and geographic location (Table 2). For each IPF field testing site, two nurses abstracted medical records for 75 discharges each for a total of 150. Twenty percent of each nurse's discharges were randomly selected and assigned to the other nurse abstractor to assess the reliability of the nurse abstractions. Additionally, two clinicians per facility reviewed medical records for a sub-sample (10 percent) of the 150 discharges to determine the validity of the principal diagnosis, based on information contained in the record. Fifty percent of each clinician's discharges were randomly selected and assigned to the other clinician abstractor to assess the reliability of the clinician abstractions. Reliability scores between the two clinicians were calculated.

At the start of testing, each test site received a one-hour training by HSAG on the abstraction instructions and process and a one-hour follow-up meeting after review of the first 10 medical records to provide clarifications, if needed.

Table 2. Characteristics of Test Sites

Study ID	State	Bed Size	Type	Teaching Facility	Type of Medical Record
1	WV	Large	Unit	Yes	EPIC
2	MI	Medium	Unit	Yes	McKesson
3	AZ	Medium	Freestanding	No	Paper Records
4	AZ	Large	Freestanding	No	Paper Records
5	MD	Large	Freestanding	Yes	Allscripts®
6	CA	Small	Unit	No	Cerner
7	LA	Large	Unit	Yes	Epic

2.1.1 Measure Implementation

If implemented, this measure would be calculated by CMS entirely from Medicare fee-for-service claims data. While medical record abstraction was used for measure testing, facilities would not be required to collect or abstract any data for calculation of this measure.

2.2 Denominator Definition

The target population for this measure is Medicare FFS beneficiaries aged 18 years and older who were discharged from IPFs with a principal diagnosis of MDD, schizophrenia, or bipolar disorder.

2.2.1 Development of Denominator Inclusion Criteria

A key assumption of this measure is that pharmacotherapy is prescribed to all patients discharged from IPFs who are diagnosed with MDD, schizophrenia, or bipolar disorder. We carefully constructed the denominator to ensure that it would be as inclusive as possible, while excluding patients for whom pharmacotherapy may not be appropriate.

Clinical experts were consulted and empirical analyses were conducted to determine the best approach to identify patients with a diagnosis of MDD, schizophrenia, or bipolar disorder. We reviewed existing measures that contained any of these three conditions and compiled diagnosis code lists that aligned with those definitions. We then looked at the frequency of each code in our patient population and reviewed the codes with clinical experts on the Continuation of Medication Workgroup (herein referred to as the workgroup) to determine if any codes should be added or removed from the denominator.

This process produced the diagnosis codes for MDD, schizophrenia, and bipolar disorder, which are listed in Section 5 (Final Measure Specifications) in Table 24, Table 25, and Table 26, respectively. The workgroup suggested using the principal diagnosis to identify the cohort. Workgroup members noted that secondary diagnoses may not be reliably captured in the claims and a principal diagnosis of either MDD, schizophrenia, or bipolar disorder would be the strongest indicator that the patient should be prescribed an evidence-based medication for one of those conditions. In addition to these clinical considerations, use of the principal diagnosis was considered to be simplest for interpretation by patients and other stakeholders. Therefore, we decided to include only patients with a principal diagnosis of MDD, schizophrenia, or bipolar disorder in the denominator for this measure.

In addition to defining the diagnoses of the target population, several other criteria (variables) are required for an inpatient stay to be eligible for inclusion in the denominator. Patients must be enrolled in Medicare FFS Part A during the index admission and Parts A, B, and D at least 30-days post-discharge because the measure calculation is based entirely on claims data. To ensure that the patients included in the measure have the opportunity to fill a medication during the follow-up period, patients must be alive at discharge and alive during the follow-up period.

Similarly, patients must be discharged to home or home health care because patients discharged against medical advice, to law enforcement, or to any other type of facility may not have received complete discharge instructions and may not have the opportunity to fill a medication during the follow-up period. Finally, the measure is limited to patients 18 years of age or older at admission because prescribing practices may differ between adults and children. Supporting data and results are presented in Section 3. The final denominator inclusion criteria are listed below and in Section 5.2.

1. Discharges from an IPF with a principal diagnosis of MDD, schizophrenia, or bipolar disorder as defined by diagnosis codes in Section 5 in Table 25, Table 26, and Table 27, respectively
2. Patients 18 years of age or older at admission
3. Patients enrolled in Medicare FFS Part A and Part B during the index admission and Parts A, B, and D at least 30-days post-discharge
4. Patients alive at discharge and alive during the follow-up period
5. Discharges with a status code indicating that they were discharged to home or home health care

2.2.2 Development of Denominator Exclusion Criteria

We analyzed denominator exclusion criteria to ensure that pharmacotherapy would be indicated following each eligible discharge. We considered whether to exclude discharges that were followed by readmission to an IPF, acute care hospital, or critical access hospital during the follow-up period because medications provided during those subsequent visits may not appear in the claims data. To evaluate this potential exclusion criterion, we compared the readmission rates of patients who filled an evidence-based medication prescription during the follow-up period (numerator positive) to those who did not (numerator negative) and reviewed those results with the workgroup.

We evaluated situations where an alternative therapy may be available to some patients in lieu of pharmacotherapy. To that end, we considered excluding patients who received electroconvulsive therapy (ECT) during the index admission or follow-up period because ECT may indicate that pharmacotherapy was not effective for those patients. Similarly, we considered excluding patients who received transcranial magnetic stimulation (TMS) during the index admission or follow-up period because this is a Food and Drug Administration (FDA)-approved treatment recently covered by Medicare that may be performed on patients for whom pharmacotherapy was not effective. To evaluate whether patients who receive these procedures would be less likely to receive prescriptions for pharmacotherapy, we compared the frequencies of each procedure among patients who filled a prescription during the follow-up period to those of patients who did not fill a prescription during the follow-up period. Additionally, we analyzed the medical record data at the alpha test site to evaluate whether patients who received ECT during the admission were prescribed evidence-based medications at discharge. We were unable to conduct a similar analysis for TMS because of the low frequency of this therapy at the test site.

We also considered excluding patients with certain conditions for which evidence-based medications in the numerator may be contraindicated or unsafe to prescribe. Since contraindications can limit options for pharmacotherapy, patients with diagnoses for which these medications are contraindicated do not meet the key assumption for the measure that all patients with MDD, schizophrenia, and bipolar disorder should be prescribed evidence-based medications at discharge. Thus, including them in the measure could negatively impact facility scores. The workgroup and the technical expert panel (TEP) specifically recommended evaluating exclusions for patients who were pregnant during the admission, who had low-weight eating disorders, or who had secondary diagnoses of delirium or dementia. Exclusions for pregnancy, low-weight eating disorders, and delirium were evaluated in the entire cohort because many medications in the numerator are relatively contraindicated for patients with these secondary conditions. The exclusion for dementia was only evaluated for patients with a principal diagnosis of schizophrenia because the relative contraindication for use in patients with dementia is limited to antipsychotic medications. Though antipsychotics are included in the numerator for bipolar disorder as

well, other pharmacotherapies are available for treatment of that condition that would meet the numerator criteria. For patients with schizophrenia and dementia, pharmacotherapy options are limited outside of the class of antipsychotics. To evaluate each exclusion, we compared the proportion of numerator positive discharges for patients with potential exclusions to those of patients without those potential exclusions.

The list of exclusions was finalized with input from the workgroup and the TEP. The results of all exclusion analyses are provided in Section 3.

2.3. Numerator Definition

2.3.1 Evidence-Based Medications

The numerator for this measure is defined as any discharge in the measure denominator with at least one administrative claim for an evidence-based medication filled 2 days prior to discharge through 30 days post-discharge. To specify the numerator, we compiled lists of medications in existing quality measures related to the treatment of MDD, schizophrenia, and bipolar disorder. Specifically, we referred to the Antidepressant Medication Management measure from the Healthcare Effectiveness Data and Information Set (HEDIS) 2015 for MDD, the Adherence to Antipsychotic Medications for Individuals with Schizophrenia measure (NQF #1879) for schizophrenia, and the Adherence to Mood Stabilizers for Individuals with Bipolar I Disorder measure (NQF #1880) for bipolar disorder. Staff pharmacists reviewed the list of medications for completeness and appropriateness in the IPF setting and referenced FDA-approved labeling and practice guidelines from the APA and VA/DoD to confirm the safety and efficacy of each medication. Each clinical recommendation was graded on clinical confidence (Table 3).

Table 3. Clinical Guideline Grade Definitions

Grade	Definition
APA Grade I	Recommended with substantial clinical confidence
APA Grade II	Recommended with moderate clinical confidence
APA Grade III	May be recommended on the basis of individual circumstances
VA/DoD Grade A	Good evidence was found that the intervention improves important health outcomes and concludes that benefits substantially outweigh harm
VA/DoD Grade B	At least fair evidence was found that the intervention improves health outcomes and concludes that benefits outweigh harm
VA/DoD Grade I	Evidence that the intervention is effective is lacking, or poor quality, or conflicting, and the balance of benefits and harms cannot be determined

For patients with MDD, both sets of guidelines identified selective serotonin reuptake inhibitors (SSRIs), serotonin norepinephrine reuptake inhibitors (SNRIs), mirtazapine, and bupropion as first-line treatments for patients with MDD (APA Grade I, VA/DoD Grade B).[18,19] Both guidelines also recommend monoamine oxidase inhibitors for patients who have not responded to other treatments or who have not achieved adequate remission. For patients with schizophrenia, the guidelines from the APA recommend the use of first-generation (typical) antipsychotics and second-generation (atypical) antipsychotics as first-line treatments for patients with schizophrenia (Grade I).[23] For patients with bipolar disorder, the guidelines from the APA and the VA/DoD recommend lithium, typical antipsychotics, atypical antipsychotics, and anticonvulsants for patients with bipolar disorder (APA Grades II, III; VA/DoD Grades A, B, I).[24,25] The APA guidelines stress that if psychosocial therapy is used to treat this condition, it should be used in combination with pharmacotherapyAdditional drug classes and therapeutic combinations were identified by review of the FDA-approved drug labeling.

To confirm that the lists of medications for each condition were appropriate and comprehensive, clinician reviewers at the alpha testing site reviewed medical records from discharges where medications were either not prescribed at discharge or were not on our list of evidence-based medications for the corresponding discharge diagnosis. For discharges where no medication was prescribed at discharge, we reviewed each medical record to determine if there were circumstances where it was appropriate to omit pharmacotherapy and if those circumstances would qualify as measure exclusions. For instances where the medication that was prescribed at discharge was not on the list of evidence-based medications, staff pharmacists reviewed the medical records to ensure the medication did not need to be included in the measure numerator. Staff pharmacists reviewed the lists of medications with the workgroup and the TEP to ensure that the lists were complete. The final lists of medications are specified using National Drug Codes (NDCs) in Part D claims, with the exception of LAIs, which are specified using J-codes in Part A and Part B claims. The lists of medications are provided in Table 28, Table 29, and Table 30 in Section 5.

2.3.2 Follow-up Period

We considered 30-day, 60-day, and 90-day follow-up periods for continuation of medication post-discharge from a psychiatric admission. While it is critical for patients hospitalized for MDD, schizophrenia, or bipolar disorder to continue evidence-based medications to manage their symptoms and avoid adverse effects like withdrawal, autonomic instability, or psychiatric decompensation, we recognize that some patients may not need to fill a prescription directly following their discharge from an IPF.[34] Some patients may be given medications at discharge or have a supply of medication at home.

To evaluate the most appropriate follow-up period, we first examined the percent of discharges that met the numerator criteria in each 30-day interval to observe when most medication prescription fills were occurring. We then calculated the percent of discharges for each condition where the patient had filled a prescription for a 30-, 60-, or 90-day supply of an evidence-based medication in the 90 days prior to the admission date. This analysis was conducted to determine whether patients were likely to have a supply of medications at home that may exceed the length of the follow-up period.

We also considered including outpatient medications filled prior to discharge in the follow-up period. We found that some facilities work with outpatient pharmacies or the patient's support system to ensure medications are filled prior to the day of discharge to encourage continuation of treatment in the outpatient setting. Additionally, we found claims for some long-acting injectable (LAI) medications administered during the inpatient stay, which would be appropriate to capture in the numerator since those medications ensure continuity of treatment into the outpatient setting. To evaluate how many days prior to discharge to include in the follow-up period, we evaluated the number of additional discharges that met the numerator criteria by day prior to discharge. For this analysis, we included outpatient medications in Parts A, B, and D.

2.4 Measure Score

The measure is scored at the facility level. The measure is scored as a percentage and is calculated by dividing the included discharges in the denominator by the number of discharges for which there was at least one claim for a medication in the numerator during the follow-up period. A higher percentage indicates a higher rate of medication continuation during the follow-up period and better quality of care.

We considered several reporting options to ensure that each performance period would contain enough data to calculate reliable facility-level results and that measure scores reflect timely performance data. To evaluate each reporting option, we used a minimum denominator size of 75 discharges (rationale provided in Section 3.5.1). We considered whether it would be feasible to report separate 30-day medication continuation rates for MDD, schizophrenia, and bipolar disorder. After applying inclusion and exclusion criteria to the 2014 claims data, we

calculated the numerators and denominators by condition and overall for each IPF. We determined the percent of IPFs that had at least 75 discharges in the denominator for each scenario. After we decided the most appropriate reporting option for the measure scores, we conducted analyses to determine how many years of data would be required to achieve reliable measure scores. We sought to use the shortest time frame that produced reliable results because longer time frames make it more difficult for facilities to interpret the results and evaluate the impact of quality improvement. The reliability analyses are described in Section 2.5.

To evaluate whether there is currently a performance gap and variation in performance across facilities, we applied all inclusion and exclusion criteria and used the final reporting approach to calculate facility-level measure scores. We observed the distribution of medication continuation rates and the difference between IPFs in the 90th percentile of performance and IPFs in the 10th percentile. To identify statistically significant differences in performance, we calculated 95% confidence intervals (95% CI) around the measure scores for each IPF and compared the 95% CI to the overall medication continuation rate across all IPFs. If the confidence intervals did not overlap with the overall mean, the difference was considered statistically significant.

2.5 Reliability and Validity Testing

2.5.1 Reliability

We empirically assessed the reliability of the measure score. Because this measure is calculated using Medicare claims data and data element validity was assessed, an assessment of the reliability of data elements was not necessary.

2.5.1.1 Measure Score Reliability

To examine the reliability of the measure scores, we utilized the approach proposed by Adams[35] and Scholle et al.[36] to assess the precision of provider-level performance scores. The following is quoted from the tutorial published by Adams:

> Reliability is a key metric of the suitability of a measure for [provider] profiling because it describes how well one can confidently distinguish the performance of one physician from another. Conceptually, it is the ratio of signal to noise. The signal in this case is the proportion of the variability in measured performance that can be explained by real differences in performance. There are three main drivers of reliability: sample size, differences between physicians, and measurement error. At the physician level, sample size can be increased by increasing the number of patients in the physician's data as well as increasing the number of measures per patient.

For this measure, the signal-to-noise ratio was calculated as a function of the variance between IPFs (signal) and the variance within an IPF (noise). Reliability was estimated using a beta-binomial model. This approach has two basic assumptions:

1. Each measured entity has a true pass rate, p, which varies; and,
2. The measured entity's score is a binomial random variable conditional on the measured entity's true value, which comes from the beta distribution.

Reliability scores vary from 0.0 to 1.0. A score of 0.0 implies that all variation is attributed to measurement error (noise); whereas, a reliability of 1.0 implies that all variation is caused by a real difference in performance across IPFs. In a simulation, Adams showed that differences between physicians started to be seen at a reliability score of 0.7, and significant differences could be seen at a reliability score of 0.9. For our analysis, we set a minimum reliability score of 0.7 to indicate sufficient signal strength to discriminate performance between IPFs.

Using methodology described by Scholle et al., reliability estimates were computed separately, based on the mean denominator size for IPFs within each denominator category. As Scholle described in the article, the reliability estimate at the mean denominator for each category should reflect "the typical experience of IPFs in this population." Based on these analyses, we selected the smallest denominator that yielded a 0.7 reliability score as the minimum denominator for this measure. The length of the performance period was adjusted to increase the number of facilities that meet the minimum denominator size.

2.5.2 Validity

We empirically assessed the validity of both the data elements used to calculate the medication continuation rates and the facility-level medication continuation rates.

2.5.2.1 Data Element Validity

To confirm the validity of the principal diagnosis codes, clinician reviewers at the test sites recorded their assessments of each patient's primary diagnosis based on the symptoms in the medical record. These assessments were compared to the principal diagnoses for those same patients in the claims data to calculate the positive predictive value. A high positive predictive value confirmed that the patients in the denominator had the condition that corresponded with the list of medications in the numerator. A low positive predictive value indicated that the medications in the numerator may not have been appropriate for the patients in the denominator.

To confirm the validity of the measure construct, nurse reviewers abstracted the medications recorded in the medical record as prescribed at discharge. We determined whether at least one of the medications prescribed was evidence-based to confirm that there was an intent to prescribe pharmacotherapy. When evidence-based medications were not prescribed, the nurse reviewers documented the rationale, so we could determine if additional exclusions were necessary or it was the result of a quality deficit. We compared the information on evidence-based prescribing at discharge to the numerator designation for each case and calculated the positive predictive value to confirm that there was a relationship between clinical care at the IPF and the patients' ability to continue evidence-based medications after discharge. While prescribing an evidence-based medication is not sufficient to improve medication continuation on its own, this analysis is important to establish that medication continuation in this time frame is directly related to the IPF and not another healthcare provider. Finally, nurse reviewers abstracted the names, doses, and days' supply of medications that were provided to the patients at discharge but not filled using the patient's insurance. These medications would not appear in the numerator and the patients would not need to fill prescriptions during the follow-up period if they were dispensed a supply that exceeded the follow-up period.

2.5.2.2 Measure Score Validity

Medication continuation rates for each IPF were compared to their scores on three related measures:

- Follow-Up After Hospitalization (7-Day)
- Follow-Up After Hospitalization (30-Day)
- IPF 30-Day All-Cause Unplanned Readmission Measure

We would expect the 7- and 30-day follow-up rates to be positively correlated with the medication continuation rates because higher rates for all three measures indicate better care coordination. Conversely, we would expect the medication continuation rates to be negatively correlated with the readmission rates because readmissions may indicate a lack of care coordination. To assess whether these relationships held true and that the medication continuation rates were valid, we tested the measure distributions for normality at each unit of analysis, selected the appropriate statistical test for the distribution, and assessed the significance of the correlation coefficient.

In addition to empirical validity testing, we asked the TEP to assess the face validity of the measure scores to obtain key stakeholder feedback. Specifically, the TEP members were asked whether they agreed, disagreed, or were unable to rate the following statement:

The performance rating from the continuation of medication measure, as specified, represents an accurate reflection of facility-level rates of evidence-based medication continuation for MDD, schizophrenia, or bipolar disorder following discharge from an IPF.

2.6 Disparities Analyses

In order to assess whether disparities in measure performance exist between subpopulations of the measure cohort, we used the method employed by the Agency for Healthcare Research and Quality (AHRQ) for the National Healthcare Quality and Disparities Report.[37] Two criteria were applied to determine meaningful differences between the performance for a reference group and another population group. A group's results may be interpreted as:

- Better than the reference group by at least a 10% relative difference and with a $p<0.05$
- Worse than the reference group by at least a 10% relative difference and with a $p<0.05$
- Same as the reference group with less than a 10% relative difference and with a p-value <0.05 or >0.05

Relative differences were calculated by subtracting the reference group from each demographic group and dividing it by the reference group. Statistical significance was determined using a two-tailed chi-square test of associations.

3. Results

This section provides the results of the data analyses that informed the inclusion and exclusion criteria for the denominator and the definition of the numerator and follow-up period. We present calculations of the facility-level measure scores, the reliability of the measure scores, and the validity of the data elements and measure score. Finally, we show the results of the disparities analysis for demographic groups in the cohort.

3.1 Denominator

3.1.1 Inclusion Analysis

Schizophrenia was the most common principal discharge diagnosis followed by MDD and bipolar disorder (Table 4). More detailed information on the frequency of diagnoses by ICD-9-CM (International Classification of Diseases, Ninth Revision, Clinical Modification) code are provided in Appendix 3 (Table 31, Table 32, and Table 33).

Table 4. Distribution of Principal Discharge Diagnoses Across IPFs

Condition	IPFs	Mean	SD	Min	10th Pctl	Lower Quartile	Median	Upper Quartile	90th Pctl	Max
MDD	1,651	34.8	19.0	0.8	11.7	21.4	32.5	45.7	61.4	100
Schizophrenia	1,655	40.2	19.9	0.6	15.2	25.7	38.0	52.7	67.4	100
Bipolar disorder	1,658	27.3	11.8	1.0	14.3	20.0	26.1	33.3	40.6	100

3.1.2 Exclusion Analysis

3.1.2.1 Readmissions

Qualifying discharges followed by a claim for an evidence-based medication during the follow-up period (numerator positive) have an unplanned readmission rate of 21.0% (Table 5). Discharges not followed by a claim for an evidence-based medication (numerator negative) have a slightly higher unplanned readmission rate of 22.4%, which is supported by the literature that shows that failure to continue medications can increase the risk of readmission.[1,2] Given that readmissions could result from failure to fill a medication and that IPFs with high readmission rates could be at an advantage if those discharges were excluded from the denominator, we decided not to exclude discharges that result in readmission from the denominator.

However, we conducted additional analyses to ensure that readmissions were not interfering with patients' ability to fill their medications during the follow-up period. We found that 82% of readmitted patients who filled an evidence-based medication during the follow-up period filled it before the readmission date, which indicates that the readmission itself should not have much impact on patients' ability to fill their medications during the follow-up period.

Table 5. Unplanned Readmission Rate by Diagnosis for IPF Discharges

Diagnosis	Denominator	Readmissions	Rate
MDD	139,355	24,601	17.7
Numerator positive	99,917	17,111	17.1
Numerator negative	39,438	7,490	19.0
Schizophrenia	217,417	50,771	23.4
Numerator positive	164,275	37,569	22.9
Numerator negative	53,142	13,202	24.8
Bipolar	132,376	29,207	22.1
Numerator positive	99,991	21,901	21.9
Numerator negative	32,385	7,306	22.6
Overall	489,148	104,579	21.4
Numerator positive	364,183	76,581	21.0
Numerator negative	124,965	27,998	22.4

3.1.2.2 Alternative therapies

ECT is used as a form of treatment in the IPF patient population (3.1%). We fully considered whether or not to exclude patients with ECT from the denominator because it is sometimes used when patients fail pharmacotherapy. Based on clinical considerations, the TEP and the workgroup favored excluding patients who received ECT. To further explore the exclusion of patients with ECT from the denominator, we conducted an analysis of inpatient psychiatric stays among Medicare beneficiaries discharged from IPFs alive with Parts A, B, and D enrollment through the follow-up period. Results showed that most patients receiving ECT also filled evidence-based medications during the follow-up period across all three conditions (Table 6). In the medical record review at the alpha testing site, ECT was the most common alternative therapy recommended. Among patients prescribed ECT who did not fill a prescription for an evidence-based medication during the follow-up period, three patients received a prescription for an evidence-based medication, three received a prescription for a medication that was not evidence-based, and one did not receive any medication prescriptions at discharge. Given that ECT may be used as an alternative when patients fail pharmacotherapy and that the medical record review showed that patients receiving ECT did not always receive an evidence-based prescription, the TEP and workgroup recommended the exclusion from the denominator of patients receiving ECT during the index admission or follow-up period.

Table 6. Frequency of ECT During or After the Index Admission

Principal Condition	All IPF Admissions		ECT During Admission or Follow-Up Period			No ECT During Admission or Follow-Up Period		
	Frequency	% Rx	Frequency	% Total	% Rx	Frequency	% Total	% Rx
MDD	139,355	71.7	7,414	5.3	76.3	131,941	94.7	71.4
Schizophrenia	217,417	75.6	3,086	1.4	77.3	214,331	98.6	75.5
Bipolar disorder	132,376	75.5	4,474	3.4	74.6	127,902	96.6	75.6
Overall	489,148	74.5	14,974	3.1	76.0	474,174	96.9	74.4

Similar to ECT, TMS procedures are also used as an alternative therapy when patients fail pharmacotherapy. TMS is a newer procedure and is still rare in the IPF setting, but its use may increase in the future. An analysis of inpatient psychiatric stays among Medicare beneficiaries discharged from IPFs alive with Parts A, B, and D enrollment through the follow-up period showed that most patients receiving TMS also filled evidence-based

medications during the follow-up period (Table 7). However, since TMS may be used as an alternative when patients fail pharmacotherapy, the TEP and workgroup recommended the exclusion of patients receiving TMS during the index admission or follow-up period from the denominator.

Table 7. Frequency of TMS During the Stay or After the Index Admission for MDD, Schizophrenia, or Bipolar Disorder

Principal Condition	All IPF Admissions		TMS During Admission or Follow-Up Period			TMS During Admission or Follow-Up Period		
	Frequency	% Rx	Frequency	% Total	% Rx	Frequency	% Total	% Rx
Overall	489,148	74.5	76	0.0	76.3	489,072	100.0	74.5

3.1.2.3 Diagnoses for Which Medications Are Contraindicated

Even though pregnancy is rare in this patient population (0.1%), we fully considered whether or not to exclude pregnant women from the denominator. Based on clinical considerations, the TEP and the workgroup favored excluding patients who were pregnant. To further explore the exclusion of pregnant women from the denominator, we evaluated whether they were filling evidence-based medications from the numerator list. We analyzed inpatient psychiatric stays among beneficiaries discharged from IPFs alive with Parts A, B, and D enrollment through the follow-up period. The results showed that pregnant patients had empirically lower rates of filling evidence-based medications during the follow-up period than patients who were not pregnant (60.4% compared to 74.5%) (Table 8), which supports the TEP and workgroup recommendations. Therefore, we excluded pregnant patients from the measure.

Table 8. Follow-up Rates for Patients Who Are and Are Not Pregnant

Condition	All IPF Admissions		Pregnant			Not Pregnant		
	Frequency	% Rx	Frequency	% Total	% Rx	Frequency	% Total	% Rx
MDD	139,355	71.7	59	0.0	59.3	139,296	99.9	71.7
Schizophrenia	217,417	75.6	138	0.1	59.4	217,279	99.9	75.6
Bipolar disorder	132,376	75.5	134	0.1	61.9	132,242	99.9	75.5
Overall	489,148	74.5	331	0.1	60.4	488,817	99.9	74.5

Even though secondary diagnoses of delirium were rare in this patient population (2.0%), we fully considered whether or not to exclude patients with delirium from the denominator. Based on clinical considerations, the TEP and the workgroup favored excluding patients with delirium. To further explore the exclusion of patients with delirium from the denominator, we evaluated whether they were filling evidence-based medications from the numerator list. We analyzed inpatient psychiatric stays among beneficiaries discharged from IPFs alive with Parts A, B, and D enrollment through the follow-up period. The results showed that patients with delirium had empirically lower rates of filling evidence-based medications during the follow-up period than patients without delirium (70.3% compared to 74.5%) (Table 9), which supports the TEP and workgroup recommendations. Therefore, we excluded patients with delirium from the measure.

Table 9. Follow-up Rates for Patients With and Without Secondary Diagnoses of Delirium

Principal Condition	All IPF Admissions		Delirium			No Delirium		
	Frequency	% Rx	Frequency	% Total	% Rx	Frequency	% Total	% Rx
MDD	139,355	71.7	3,420	2.5	66.5	135,935	97.5	71.8
Schizophrenia	217,417	75.6	3,837	1.8	71.9	213,580	98.2	75.6
Bipolar disorder	132,376	75.5	2,385	1.8	73.2	129,991	98.2	75.6
Overall	489,148	74.5	9,642	2.0	70.3	479,506	98.0	74.5

Likewise, some medications for the treatment of schizophrenia and bipolar disorder, such as antipsychotics, are contraindicated for patients with a secondary diagnosis of dementia. Because there are alternative medications available for the treatment of bipolar disorder, we focused our exclusion analysis on patients with schizophrenia and a secondary diagnosis of dementia. A secondary diagnosis of dementia was rare among patients with schizophrenia (3.2%). An analysis of inpatient psychiatric stays among beneficiaries discharged from IPFs alive with Parts A, B, and D enrollment through the follow-up period showed that patients with schizophrenia and a secondary diagnosis of dementia had empirically lower rates of filling evidence-based medications during the follow-up period than patients without dementia (65.3% compared to 75.9%) (Table 10), which supports the TEP and workgroup recommendations. Therefore, we excluded patients with schizophrenia and a secondary diagnosis of dementia.

Table 10. Follow-up Rates for Patients With Schizophrenia With and Without Secondary Diagnoses of Dementia

	All IPF Admissions		Secondary Dementia			No Dementia		
Principal Condition	Frequency	% Rx	Frequency	% Total	% Rx	Frequency	% Total	% Rx
Schizophrenia	217,417	75.6	6,971	3.2	65.3	210,446	96.8	75.9

Even though secondary diagnoses of low-weight eating disorders were rare in this patient population (0.5%), we fully considered whether or not to exclude patients with low-weight eating disorders from the denominator. Based on clinical considerations, the TEP and the workgroup favored excluding these patients. To further explore the exclusion, we evaluated whether patients with low-weight eating disorders were filling evidence-based medications from the numerator list. We analyzed inpatient psychiatric stays among beneficiaries discharged from IPFs alive with Part D enrollment through the follow-up period. The results showed that patients with low weight eating disorders had empirically higher rates of filling evidence-based medications during the follow-up period than patients without eating disorders (77.4% compared to 74.4%) (Table 11), which does not support the TEP and workgroup assessment that these patients are not prescribed the medications in this measure. Therefore, we decided not to exclude patients with low-weight eating disorders from the measure.

Table 11. Follow-up Rates for Patients With and Without Low-Weight Eating Disorders

Principal Condition	All IPF Admissions		Eating Disorder			No Eating Disorder		
	Frequency	% Rx	Frequency	% Total	% Rx	Frequency	% Total	% Rx
MDD	139,355	71.7	985	0.7	74.8	138,370	99.3	71.7
Schizophrenia	217,417	75.6	604	0.3	81.0	216,813	99.7	75.5
Bipolar disorder	132,376	75.5	904	0.7	77.9	131,472	99.3	75.5
Combined	489,148	74.5	2,493	0.5	77.4	486,655	99.5	74.4

3.1.3 Final Denominator

There were 402,106 eligible IPF discharges that met the inclusion criteria. After applying all exclusions, the final denominator consisted of 380,861 IPF discharges (Table 12). Note that discharges may meet multiple exclusion criteria.

Table 12. Denominator Exclusions

Exclusion	Count	% Eligible Discharges
Total Number of Eligible IPF Discharges After Inclusion Criteria Were Applied	402,106	100
Exclusions		
Received ECT during the inpatient stay or follow-up period	11,691	2.9
Received TMS during the inpatient stay or follow-up period	54	0.0
Pregnant during the inpatient stay	277	0.1
Secondary diagnosis of delirium	6,043	1.5
Principal diagnosis of schizophrenia and secondary diagnosis of dementia	2,584	0.6
Total Number of IPF Discharges in Denominator	380,861	94.7

3.2 Numerator

3.2.1 Medications to Define Numerator

The medical record review at the alpha testing site found that only 5 of 150 patients were not given a prescription at discharge. Four of the five patients met one of the exclusion criteria and would not qualify for the measure denominator. Among the patients for whom medications were prescribed at discharge but were not evidence-based, pharmacist review confirmed that none of the medications were indicated for the patient's principal discharge diagnosis. Furthermore, medication discrepancies (e.g., intent to prescribe was documented in the medical record but there was no documentation that a prescription was provided at discharge) were identified by the clinical reviewers in many of those cases, which indicates that the failure to prescribe evidence-based medications at discharge was the result of a medical error rather than an intentional clinical decision. No medications were added to the numerator as a result of the medical record review. Pharmacist review and workgroup input confirmed that the medications listed in Section 5 represent the comprehensive list of medications for the treatment of MDD, schizophrenia, and bipolar disorder.

3.2.2 Follow-up Period

The results of the analyses to determine the time to the first prescription fill following discharge showed that across the three principal discharge diagnoses included in the measure denominator, the majority of patients (67%–74%) filled the first evidence-based prescription within 30 days of discharge (Table 13). For each condition, at least 93% of the prescriptions filled prior to the admission were for a 30-day supply (Table 14). This indicates that most patients would not have a supply of medication at home that would last through the 30-day follow-up period. It is important to consider that medications may be adjusted during the inpatient stay, and patients may need to fill a new prescription following discharge even if they have medications at home. These analyses confirmed that the 30-day follow-up period is appropriate for measuring rates of medication continuation.

Table 13. Frequency to First Prescription Fill After IPF Discharge

Days Post Discharge	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MDD				
0-30	141,855	66.7	141,855	66.7
31-60	18,065	8.5	159,920	75.2
61-90	8,436	4.0	168,356	79.1
91+	20,404	9.6	188,760	88.7
No prescription	24,055	11.3	212,815	100.0
Schizophrenia				
0-30	181,297	72.3	181,297	72.3
31-60	19,144	7.6	200,441	80.0
61-90	9,364	3.7	209,805	83.7
91+	23,851	9.5	233,656	93.2
No prescription	16,948	6.8	250,604	100.0
Bipolar disorder				
0-30	87,262	73.7	87,262	73.7
31-60	8,288	7.0	95,550	80.7
61-90	3,879	3.3	99,429	84.0
91+	9,808	8.3	109,237	92.3
No prescription	9,164	7.7	118,401	100.0

Table 14. Frequency of 30-, 60-, and 90-Day Supply of Medications in the 90 Days Prior to Admission

Day Supply	Frequency	Percent
MDD		
30	385,440	93.9
60	2,448	0.6
90	22,510	5.5
Schizophrenia		
30	483,046	98.5
60	1,763	0.4
90	5,759	1.2
Bipolar disorder		
30	281,141	96.8
60	1,294	0.5
90	8,051	2.8

Clinical experts were consulted to provide input on the best approach for including outpatient medications filled during the inpatient stay in the numerator. They agreed that discharge planning may start as early as two days prior to discharge. Findings during field testing confirmed that some facilities work with outpatient pharmacies or the patient's caregivers to fill medications for the patient prior to discharge. An evaluation of the impact of including outpatient medications by day prior to discharge found that most outpatient medications filled during

the inpatient stay are filled one day prior to discharge (Table 15). However, to ensure that the measure numerator captures medications filled as part of the patient's discharge plan, the numerator includes outpatient medications filled from 2 days prior to discharge through 30 days post-discharge.

Table 15. Impact of Outpatient Medications Filled During the Admission on the Numerator by Day Prior to Discharge

Day prior to Discharge	Number of New Numerator Positive Discharges	Impact on Numerator	Cumulative Number of New Numerator Positive Discharges	Cumulative Impact on Numerator
1	2,898	+1.00%	2,898	+1.00%
2	638	+ 0.22%	3.536	+ 1.22%

3.3 Measure Score

The percentage of IPFs with at least 75 discharges in the denominator in the 2013–2014 Medicare claims data was 70% for a combined measure score, compared to a range of 30%-42% for individual scores by principal discharge diagnosis. We decided to report this measure as a combined rate to increase the number of facilities that can publicly report a measure score and to improve interpretability of those measure scores. For the analysis of the measurement period, the number of IPFs with at least 75 discharges in their denominator for a 1-year measurement period was 50% compared to 70% for a 2-year measurement period. We decided to use a 2-year measurement period to maximize the number of facilities that can publicly report measure scores.

An analysis of 2013-2014 Medicare claims data indicated performance varied between high- and low-performing facilities across more than 1,600 IPFs for each of the three diagnoses (Table 16). For the combined measure score, there is about a 21-percentage point difference between the 10th and 90th percentiles (67%-88%) and a median score of 79.6%.

Table 16. Distribution of Facility Performance

Diagnosis	# IPFs	Mean	SD	Min	10th Pctl	Lower Quartile	Median	Upper Quartile	90th Pctl	Max
MDD	1,651	75.5	13.9	0.0	60.0	69.6	77.1	83.3	89.7	100.0
Schizophrenia	1,655	79.1	15.3	0.0	63.6	73.1	81.5	87.9	95.5	100.0
Bipolar disorder	1,658	78.3	14.4	0.0	63.9	72.5	80.0	86.4	93.5	100.0
Combined	1,694	78.0	11.1	0.0	66.7	73.6	79.6	84.4	88.3	100.0

About 24% of facilities had medication continuation rates that were statistically better than the national rate, and about 13% of facilities had medication continuation rates that were statistically worse than the national rate (Table 17). These results indicate ample room for improvement and meaningful differences in quality of care between the highest- and lowest-performing facilities.

Table 17. Distribution of IPFs Compared to the National Medication Continuation Rate

Performance Categorization	Count IPFs	Percent IPFs
Total IPFs	1,694	100.0
Better than national rate	399	23.6
No different than national rate	572	33.8
Worse than national rate	213	12.6
Fewer than 75 discharges during the performance period	510	30.1

3.4 Reliability and Validity

3.4.1 Reliability

A minimum denominator size of 75 discharges is needed to attain an overall reliability score of at least 0.7 (Table 18), which is within acceptable norms and indicates sufficient signal strength to discriminate performance between facilities, using the method of mean denominator and volume categories. With a minimum denominator of 75 discharges, 1,184 IPFs (70%) have enough discharges within a two-year measurement period for public reporting. The removal of smaller facilities does not have an appreciable impact on the distribution of measure scores (Table 19). These results indicate the measure score is reliable by adjusting the minimum denominator to require at least 75 discharges during the measurement period.

Table 18. IPF Reliability and Assessment of Adequacy for Tests Conducted

	Minimum Denominator	# of IPFs N=1,694 (%)	Mean Rate (%) of IPFs	Reliability Score
Overall	75	1,184 (69.9)	78.0	0.77

Table 19. Comparison of IPF Measure Score Distribution by Denominator Minimum

	# IPFs	Mean	SD	Min	10th Pctl	Lower Quartile	Median	Upper Quartile	90th Pctl	Max
Overall	1,694	78.0	11.1	0.0	66.7	73.6	79.6	84.4	88.3	100.0
Denominator ≥ 75	1,184	78.0	7.9	21.1	68.3	73.9	79.1	83.4	86.5	98.5

3.4.2 Validity

3.4.2.1 Data Element Validity

The medical record review in the seven test sites confirmed that the principal discharge diagnoses in the administrative claims data are a valid source for identifying the primary cause of admission to the IPF. The positive predictive value of the claims data was 98% (928/945) (Table 20). The positive predictive values were similar across all three conditions, with 99% (291/294) for MDD, 98% (329/335) for schizophrenia, and 97% (308/316) for bipolar disorder. This indicates a high probability that a claim for a certain condition (e.g., schizophrenia) correctly predicts the principal discharge diagnosis in the medical record.

Table 20. Agreement Between Medical Record and Claims for Diagnoses

	Diagnosis In Medical Record
MDD	
MDD in claims	291
No MDD in claims	0
Total MDD	291
Schizophrenia	
Schizophrenia in claims	329
No schizophrenia in claims	10
Total schizophrenia	339
Bipolar Disorder	
Bipolar disorder in claims	308
No bipolar disorder in claims	7
Total bipolar disorder	315
Total Overall	945

During the medical record review, 92% (873/945) of patients were prescribed an evidence-based medication at discharge. Among the patients who were not prescribed an evidence-based medication, the majority of reasons identified by the medical record abstractors indicated quality deficits. For example, 61% of the patients without an evidence-based medication at discharge had medications prescribed that were not evidence-based for their principal diagnosis, 11% did not have any medications prescribed at discharge, and 5% were the result of medical errors. No reason was identified by the abstractors for 9% of patients, which could also indicate potential quality deficits. For the remaining patients, prescriptions could have been provided in addition to medications dispensed at discharge or could have been provided to patients who declined pharmacotherapy because they may decide to continue pharmacotherapy after leaving the IPF.

When comparing numerator positive cases from the Part D claims data to the medical record, the positive predictive value is 96% (622/646) as calculated from Table 21. This indicates that most patients who filled an evidence-based prescription during the 30-day follow-up period received an evidence-based prescription from the IPF at discharge. Only 33% (24/72) of patients who did not receive a prescription for an evidence-based medication at discharge were able to continue their medications during the follow-up period.

Table 21. Comparison of Medications Prescribed at Discharge to Fills During the Follow-up Period in Claims Data

	Evidence-Based Prescription at Discharge	No Evidence-Based Prescription at Discharge	Total
Numerator positive	622	24	646
Numerator negative	251	48	299
Total	873	72	945

The medical record review found that there were few discharges where the facility provided medications to patients at discharge. Among those discharges, some of the medications provided were filled for the patient through an outpatient pharmacy and appeared in the claims data. We anticipate that free medications are provided to the patient population for this measure less frequently because all patients included in the measure denominator are enrolled in Medicare Part D. Low-income Medicare patients can receive assistance with co-pays, and patients who are dually enrolled in Medicaid (70% of this cohort) receive additional assistance covering the costs of medications that are not covered by Medicare. Notes from the medical record abstractors indicate that all of the

medications provided at discharge were for 30-day supplies or less. Therefore, the patients who received medications at discharge on Day 0 would need to fill a prescription for an evidence-based medication before the end of the 30-day follow-up period to avoid gaps in treatment. Those fills would appear in the claims data.

These analyses support the conclusion that claims data are valid for assessing medication continuation and that the construct of medication continuation is valid for assessing IPF quality.

3.4.2.2 Performance Measure Score

Results of the analysis for correlations of medication continuation scores with the three conceptually related IPFQR measures are included in Table 22. The medication continuation scores were moderately correlated with the scores for 7- and 30-day follow-up after hospitalization for mental illness scores as expected ($\rho = 0.34$ and 0.43). The medication continuation scores were negatively correlated with readmission scores as expected ($\rho = -0.26$). All correlations are statistically significant at p-value < 0.0001. After reviewing these results and the proposed measure specifications, all of the 10 TEP members who were present for the face validity vote agreed that the measure score had face validity. The moderate strength of the correlations, conceptually supported directionality, and unanimous face validity assessment indicate that the scores from this measure are a valid indication of IPF quality.

Table 22. Performance Measure Score Correlation

Measure	IPFs	Correlation
Follow-Up After Hospitalization 7-day (7/1/2014 – 6/30/2015)	1,145	0.34312
Follow-Up After Hospitalization 30-day (7/1/2014 – 6/30/2015)	1,145	0.43065
IPF All-Cause Unplanned Readmission Measure (Observed) (1/1/2013 – 12/31/2014)	1,184	-0.26059

3.5 Disparities

The disparities analyses for demographic groups in the cohort are shown in Table 23. Groups are considered better or worse than the reference group if they have at least a 10% relative difference and with a $p<0.05$. Male is the reference group for gender, white is the reference group for race/ethnicity, the group 65–74 is the reference group for age, and Medicare only is the reference group for dual enrolled. Black patients have significantly worse rates of medication continuation than all other race or ethnic groups. Dually enrolled patients have significantly better rates of medication continuation than patients enrolled in only Medicare. There are no differences in performance in any of the age groups.

Table 23. Demographics

Demographic	Frequency	% Discharges (n=380,861)	% With Fill During Follow-Up	Relative Difference	p-value	Disparity Identified
Gender						
Female	185,634	48.7	80.5	8.8	<0.05	---
Male	195,227	51.3	74.0	Reference		---
Race/Ethnicity						
White	273,352	71.8	79.1	Reference		---
Black	79,753	20.9	70.4	-11.1	<0.05	Worse
Hispanic	14,808	3.9	75.8	-4.2	<0.05	---
Other	12,948	3.4	77.9	-1.6	<0.05	---
Age						
18–34	67,579	17.7	77.2	-0.5	0.14	---
35–44	77,505	20.3	77.2	-0.4	0.20	---
45–54	101,529	26.7	77.0	-0.7	<0.05	---
55–64	73,921	19.4	76.6	-1.2	<0.05	---
65–74	43,281	11.4	77.6	Reference		---
75–84	13,547	3.6	78.8	1.5	<0.05	---
85+	3,499	0.9	75.4	-2.8	<0.05	---
Dual Enrolled						
Dual enrolled	264,996	69.6	79.9	13.0	<0.05	Better
Medicare only	115,865	30.4	70.7	Reference		---

4. Summary

We developed a process measure that assesses medication continuation rates following discharge from an IPF for MDD, schizophrenia, or bipolar disorder. Continuation of medications in these patient populations is critical for management of symptoms and better health outcomes, yet current facility-level performance indicates a quality gap. Interventions implemented during an IPF stay could improve medication continuation rates, and care transition strategies could be used to influence medication adherence. By calculating the facility-level rates of medication continuation in Medicare FFS claims data, CMS aims to encourage quality improvement, specifically relating to stronger care transitions to outpatient settings. This measure can provide valuable information to providers on areas where care transitions to the outpatient setting can be improved. Using 2013-2014 data, we estimate that an additional 16,517 Medicare FFS admissions would be followed by patients filling evidence-based medications to manage their conditions during the follow-up period, if all facilities had at least the current median rate of medication continuation. We envision the addition of this measure to the suite of measures for IPFs would help to create a comprehensive picture of the quality of care patients receive at those facilities.

5. Final Measure Specifications

5.1 Performance Period

The performance period is 24 months. Data from 30 days post-discharge are needed to identify medication prescription fills in the numerator.

5.2 Denominator Inclusion Criteria

The denominator for this measure includes discharged patients:

1. From an IPF with a principal diagnosis of MDD, schizophrenia, or bipolar disorder (Table 24, Table 25, and Table 26, respectively)
2. 18 years of age or older at admission
3. Enrolled in Medicare fee-for-service Part A and Part B during the index admission and Parts A, B, and D at least 30-days post-discharge
4. Alive at discharge and alive during the follow-up period
5. With a discharge status code indicating that they were discharged to home or home health care

Table 24. Codes That Define MDD in the Denominator

Code	Description
ICD-9-CM: 296.20, 296.21, 296.22, 296.23, 296.24, 296.25	Major depressive disorder, single episode
ICD-9-CM: 296.30, 296.31, 296.32, 296.33, 296.34, 296.35	Major depressive disorder, recurrent episode
ICD-9-CM: 298.0	Depressive type psychosis
ICD-9-CM: 311	Depressive disorder, not elsewhere classified
ICD-10-CM: F32.0, F32.1, F32.2, F32.3, F32.4, F32.9	Major depressive disorder, single episode
ICD-10-CM: F33.0, F33.1, F33.2, F33.3, F33.40, F33.41, F33.9	Major depressive disorder, recurrent

Table 25. Codes That Define Schizophrenia in the Denominator

Code	Description
ICD-9-CM: 295	Schizophrenic disorders
ICD-9-CM: 295.0, 295.00, 295.01, 295.02, 295.03, 295.04, 295.05	Schizophrenic disorders, simple type
ICD-9-CM: 295.1, 295.10, 295.11, 295.12, 295.13, 295.14, 295.15	Schizophrenic disorders, disorganized type
ICD-9-CM: 295.2, 295.20, 295.21, 295.22, 295.23, 295.24, 295.25	Schizophrenic disorders, catatonic type
ICD-9-CM: 295.3, 295.30, 295.31, 295.32, 295.33, 295.34, 295.35	Schizophrenic disorders, paranoid type
ICD-9-CM: 295.4, 295.40, 295.41, 295.42, 295.43, 295.44, 295.45	Schizophrenic disorders, schizophreniform disorder
ICD-9-CM: 295.5, 295.50, 295.51, 295.52, 295.53, 295.54, 295.55	Latent schizophrenia
ICD-9-CM: 295.6, 295.60, 295.61, 295.62, 295.63, 295.64, 295.65	Schizophrenic disorders, residual type
ICD-9-CM: 295.7, 295.70, 295.71, 295.72, 295.73, 295.74, 295.75	Schizoaffective disorder
ICD-9-CM: 295.8, 295.80, 295.81, 295.82, 295.83, 295.84, 295.85	Other specified types of schizophrenia
ICD-9-CM: 295.9, 295.90, 295.91, 295.92, 295.93, 295.94, 295.95	Unspecified schizophrenia
ICD-10-CM: F20.0, F20.1, F20.2, F20.3, F20.5, F20.81, F20.89, F20.9	Schizophrenia
ICD-10-CM: F25.0, F25.1, F25.8, F25.9	Schizoaffective disorders

Table 26. Codes That Define Bipolar Disorder in the Denominator

Code	Description
ICD-9-CM: 296.00, 296.01, 296.02, 296.03, 296.04, 296.05, 296.06	Bipolar I disorder, single manic episode
ICD-9-CM: 296.10, 296.11, 296.12, 296.13, 296.14, 296.15, 296.16	Manic disorder, recurrent episode
ICD-9-CM: 296.40, 296.41, 296.42, 296.43, 296.44, 296.45, 296.46	Bipolar I disorder, most recent episode (or current) manic
ICD-9-CM: 296.50, 296.51, 296.52, 296.53, 296.54, 296.55, 296.56	Bipolar I disorder, most recent episode (or current) depressed
ICD-9-CM: 296.60, 296.61, 296.62, 296.63, 296.64, 296.65, 296.66	Bipolar I disorder, most recent episode (or current) mixed
ICD-9-CM: 296.7	Bipolar I disorder, most recent episode (or current) unspecified
ICD-9-CM: 296.80, 296.81, 296.82, 296.89	Other and unspecified bipolar disorders
ICD-10-CM: F30.10, F30.11, F30.12, F30.13, F30.2, F30.3, F30.4, F30.8, F30.9	Manic episode
ICD-10-CM: F31.0, F31.10, F31.11, F31.12, F31.13, F31.2, F31.30, F31.31, F31.32, F31.4, F31.5, F31.60, F31.61, F31.62, F31.63, F31.64, F31.70, F31.71, F31.72, F31.73, F31.74, F31.75, F31.76, F31.77, F31.78, F31.81, F31.89, F31.9	Bipolar disorder
ICD-10-CM: F32.8	Other depressive episodes

5.3 Denominator Exclusion Criteria

The denominator for this measure excludes discharged patients who:

1. Received ECT during the inpatient stay or follow-up period
2. Received TMS during the inpatient stay or follow-up period
3. Were pregnant during the inpatient stay
4. Had a secondary diagnosis of delirium
5. Had a principal diagnosis of schizophrenia with a secondary diagnosis of dementia

Table 27 includes codes that define the denominator exclusions.

Table 27. Codes That Define the Denominator Exclusions

Code	Description
CPT: 00104, 90870, 90871, 4066F, 4067F ICD-9-CM: 94.27 ICD-10-CM: GZB0ZZZ, GZB1ZZZ, GZB2ZZZ, GZB3ZZZ, GZB4ZZZ	ECT
CPT: 90867, 90868	TMS
ICD-9-CM: 630, 631.0, 631.8, 638.0, 638.1, 638.2, 638.3, 638.4, 638.5, 638.6, 638.7, 638.8, 638.9, 640.00, 640.01, 640.03, 640.80, 640.81, 640.83, 640.90, 640.91, 640.93, 641.00, 641.01, 641.03, 641.10, 641.11, 641.13, 641.20, 641.21, 641.23, 641.30 641.31, 641.33, 641.80, 641.81, 641.83, 641.90, 641.91, 641.93, 642.00, 642.01, 642.02, 642.03, 642.04, 642.10, 642.11, 642.12, 642.13, 642.14, 642.20, 642.21, 642.22, 642.23, 642.24, 642.30, 642.31, 642.32, 642.33, 642.34, 642.40, 642.41, 642.42, 642.43, 642.44, 642.50, 642.51, 642.52, 642.53, 642.54, 642.60, 642.61, 642.62, 642.63, 642.64, 642.70, 642.71, 642.72, 642.73, 642.74, 642.90, 642.91, 642.92, 642.93, 642.94, 643.00, 643.01, 643.03, 643.10, 643.11, 643.13, 643.20, 643.21, 643.23, 643.80, 643.81, 643.83, 643.90, 643.91, 643.93, 644.00, 644.03, 644.10, 644.13, 644.20,	Pregnancy

Code	Description
644.21, 645.10, 645.11, 645.13, 645.20, 645.21, 645.23, 646.00, 646.01, 646.03, 646.10, 646.11, 646.12, 646.13, 646.14, 646.20, 646.21, 646.22, 646.23, 646.24, 646.30, 646.31, 646.33, 646.40, 646.41, 646.42, 646.43, 646.44, 646.50, 646.51, 646.52, 646.53, 646.54, 646.60, 646.61, 646.62, 646.63, 646.64, 646.70, 646.71, 646.73, 646.80, 646.81, 646.82, 646.83, 646.84, 646.90, 646.91, 646.93, 647.00, 647.01, 647.02, 647.03, 647.04, 647.10, 647.11, 647.12, 647.13, 647.14, 647.20, 647.21, 647.22, 647.23, 647.24, 647.30, 647.31, 647.32, 647.33, 647.34, 647.40, 647.41, 647.42, 647.43, 647.44, 647.50, 647.51, 647.52, 647.53, 647.54, 647.60, 647.61, 647.62, 647.63, 647.64, 647.80, 647.81, 647.82, 647.83, 647.84, 647.90, 647.91, 647.92, 647.93, 647.94, 648.00, 648.01, 648.02, 648.03, 648.04, 648.10, 648.11, 648.12, 648.13, 648.14, 648.20 648.21, 648.22, 648.23, 648.24, 648.30, 648.31, 648.32, 648.33, 648.34, 648.40, 648.41, 648.42, 648.43, 648.44, 648.50, 648.51, 648.52, 648.53, 648.54, 648.60, 648.61, 648.62, 648.63, 648.64, 648.70, 648.71, 648.72, 648.73, 648.74, 648.80, 648.81, 648.82, 648.83, 648.84, 648.90, 648.91, 648.92, 648.93, 648.94, 649.00, 649.01, 649.02, 649.03, 649.04, 649.10, 649.11, 649.12, 649.13, 649.14, 649.20, 649.21, 649.22, 649.23, 649.24, 649.30, 649.31, 649.32, 649.33, 649.34, 649.40, 649.41, 649.42, 649.43, 649.44, 649.50, 649.51, 649.53, 649.60, 649.61, 649.62, 649.63, 649.64, 649.70, 649.71, 649.73, 649.81, 649.82, 650, 651.00, 651.01, 651.03, 651.10, 651.11, 651.13, 651.20, 651.21, 651.23, 651.30, 651.31, 651.33, 651.40, 651.41, 651.43, 651.50, 651.51, 651.53, 651.60, 651.61, 651.63, 651.70, 651.71, 651.73, 651.80, 651.81, 651.83, 651.90, 651.91, 651.93, 652.00, 652.01, 652.03, 652.10, 652.11, 652.13, 652.20, 652.21, 652.23, 652.30, 652.31, 652.33, 652.40, 652.41, 652.43, 652.50, 652.51, 652.53, 652.60, 652.61, 652.63, 652.70, 652.71, 652.73, 652.80, 652.81, 652.83, 652.90, 652.91, 652.93, 653.00, 653.01, 653.03, 653.10, 653.11, 653.13, 653.20, 653.21, 653.23, 653.30, 653.31, 653.33, 653.40, 653.41, 653.43, 653.50, 653.51, 653.53, 653.60, 653.61, 653.63, 653.70, 653.71, 653.73, 653.80, 653.81, 653.83, 653.90, 653.91, 653.93, 654.00, 654.01, 654.02, 654.03, 654.04, 654.10, 654.11, 654.12, 654.13, 654.14, 654.20, 654.21, 654.23, 654.30, 654.31, 654.32, 654.33, 654.34, 654.40, 654.41, 654.42, 654.43, 654.44, 654.50, 654.51, 654.52, 654.53, 654.54, 654.60, 654.61, 654.62, 654.63, 654.64, 654.70, 654.71, 654.72, 654.73, 654.74, 654.80, 654.81, 654.82, 654.83, 654.84, 654.90, 654.91, 654.92, 654.93, 654.94, 655.00, 655.01, 655.03, 655.10, 655.11, 655.13, 655.20, 655.21, 655.23, 655.30, 655.31, 655.33, 655.40, 655.41, 655.43, 655.50, 655.51, 655.53, 655.60, 655.61, 655.63, 655.70, 655.71, 655.73, 655.80, 655.81, 655.83, 655.90, 655.91, 655.93, 656.00, 656.01, 656.03, 656.10, 656.11, 656.13, 656.20, 656.21, 656.23, 656.30, 656.31, 656.33, 656.40, 656.41, 656.43, 656.50, 656.51, 656.53, 656.60, 656.61, 656.63, 656.70, 656.71, 656.73, 656.80, 656.81, 656.83, 656.90, 656.91, 656.93, 657.00, 657.01, 657.03, 658.00, 658.01, 658.03, 658.10, 658.11, 658.13, 658.20, 658.21, 658.23, 658.30, 658.31, 658.33, 658.40, 658.41, 658.43, 658.80, 658.81, 658.83, 658.90, 658.91, 658.93, 659.00, 659.01, 659.03, 659.10, 659.11, 659.13, 659.20, 659.21, 659.23, 659.30, 659.31, 659.33, 659.40, 659.41, 659.43, 659.50, 659.51, 659.53, 659.60, 659.61, 659.63, 659.70, 659.71, 659.73, 659.80, 659.81, 659.83, 659.90, 659.91, 659.93, 660.00, 660.01, 660.03, 660.10, 660.11, 660.13, 660.20, 660.21, 660.23, 660.30, 660.31, 660.33, 660.40, 660.41, 660.43, 660.50, 660.51, 660.53, 660.60, 660.61, 660.63, 660.70, 660.71, 660.73, 660.80, 660.81, 660.83, 660.90, 660.91, 660.93, 661.00, 661.01, 661.03, 661.10, 661.11, 661.13, 661.20, 661.21, 661.23, 661.30, 661.31, 661.33, 661.40, 661.41, 661.43, 661.90, 661.91, 661.93, 662.00, 662.01, 662.03, 662.10, 662.11, 662.13, 662.20, 662.21, 662.23, 662.30, 662.31, 662.33, 663.00, 663.01, 663.03, 663.10, 663.11, 663.13, 663.20, 663.21, 663.23, 663.30, 663.31, 663.33, 663.40, 663.41, 663.43, 663.50, 663.51, 663.53, 663.60, 663.61, 663.63, 663.80, 663.81, 663.83, 663.90, 663.91, 663.93, 664.00, 664.01, 664.04, 664.10, 664.11, 664.14, 664.20, 664.21, 664.24, 664.30, 664.31, 664.34, 664.40, 664.41, 664.44, 664.50, 664.51, 664.54, 664.60, 664.61, 664.64, 664.80, 664.81, 664.84, 664.90, 664.91, 664.94, 665.00, 665.01, 665.03, 665.10, 665.11, 665.20, 665.22, 665.24, 665.30, 665.31, 665.34, 665.40, 665.41, 665.44, 665.50, 665.51, 665.54, 665.60, 665.61, 665.64, 665.70, 665.71, 665.72, 665.74, 665.80, 665.81, 665.82, 665.83, 665.84, 665.90, 665.91, 665.92, 665.93, 665.94, 666.00, 666.02, 666.04, 666.10, 666.12, 666.14, 666.20, 666.22, 666.24, 666.30, 666.32, 666.34, 667.00, 667.02, 667.04, 667.10, 667.12, 667.14, 668.00, 668.01, 668.02, 668.03, 668.04, 668.10, 668.11, 668.12, 668.13, 668.14, 668.20, 668.21, 668.22, 668.23, 668.24, 668.80, 668.81, 668.82, 668.83, 668.84, 668.90, 668.91, 668.92, 668.93, 668.94, 669.00, 669.01, 669.02, 669.03, 669.04, 669.10, 669.11, 669.12, 669.13, 669.14, 669.20,	

Code	Description
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Code	Description
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ICD-9-CM: 293.0, 293.1, 293.81, 293.82, 293.83, 293.84, 293.89, 293.9, 323.71, 323.72, 348.30, 348.31, 348.39, 349.82, 368.16, 780.1 ICD-10-CM: F05, F06.0, F06.1, F06.2, F06.30, F06.31, F06.32, F06.33, F06.34, F06.4, F06.8, F53, G92, G93.40, G93.41, G93.49, H53.16, I67.83, R44.0, R44.1, R44.2, R44.3, R48.3	Delirium
ICD-9-CM: 290.0, 290.10, 290.11, 290.12, 290.13, 290.20, 290.21, 290.3, 290.40, 290.41, 290.42, 290.43, 294.10, 294.11, 294.20, 294.21, 331.0, 331.19, 331.82 ICD-10-CM: F01.50, F01.51, F02.80, F02.81, F03.90, F03.91, F05, G30.0, G30.1, G30.8, G30.9, G31.09, G31.83	Dementia

5.4 Medications That Define the Numerator

Table 28, Table 29, and

Table 30 list the evidence-based medications by class for treatment of MDD, schizophrenia, and bipolar disorder, respectively. The route of administration includes all oral formulations and the long-acting (depot) injectable of the medications listed in this section, except where noted. Active ingredients for the oral medications are limited to oral, buccal, sublingual, and translingual formulations only. Obsolete medications with an inactive date more than three years prior to the beginning of the measurement period are excluded from NDCs.

Table 28. Medications for MDD

Type	Medication
Monoamine oxidase inhibitors	Isocarboxazid
	Phenelzine
	Selegiline (transdermal patch)
	Tranylcypromine
Selective serotonin reuptake inhibitors (SSRIs)	Citalopram
	Escitalopram
	Fluoxetine
	Fluvoxamine
	Paroxetine
	Sertraline
Serotonin modulators	Nefazodone
	Trazodone
	Vilazodone
	Vortioxetine
Serotonin norepinephrine reuptake inhibitors (SNRIs)	Desvenlafaxine
	Duloxetine
	Levomilnacipran
	Venlafaxine
Tricyclic and tetracyclic antidepressants	Amitriptyline
	Amoxapine
	Clomipramine
	Desipramine
	Doxepin
	Imipramine
	Maprotiline
	Nortriptyline
	Protriptyline
	Trimipramine
Other antidepressants	Bupropion
	Mirtazapine
Psychotherapeutic combinations	Amitriptyline-chlordiazepoxide

Type	Medication
	Amitriptyline-perphenazine
	Fluoxetine-olanzapine

Table 29. Medications for Schizophrenia

Type	Medication
First-generation antipsychotics	Chlorpromazine
	Fluphenazine
	Haloperidol
	Haloperidol lactate
	Loxapine succinate
	Molindone
	Perphenazine
	Pimozide
	Prochlorperazine
	Thioridazine
	Thiothixene
	Trifluoperazine
Second-generation (atypical) antipsychotics	Aripiprazole
	Asenapine
	Brexpiprazole
	Cariprazine
	Clozapine
	Iloperidone
	Lurasidone
	Olanzapine
	Paliperidone
	Quetiapine
	Risperidone
	Ziprasidone
Psychotherapeutic combinations	Amitriptyline-perphenazine
	Fluoxetine-olanzapine
Long-acting (depot) injectable antipsychotics	Fluphenazine decanoate
	Haloperidol decanoate
	Aripiprazole
	Aripiprazole lauroxil
	Olanzapine pamoate
	Paliperidone palmitate (1-month extended-release injection)
	Paliperidone palmitate (3-month extended-release injection)
	Risperidone microspheres

Table 30. Medications for Bipolar Disorder

Type	Medication
Anticonvulsants	Carbamazepine
	Divalproex sodium
	Lamotrigine
	Valproic acid
First-generation antipsychotics	Chlorpromazine
	Fluphenazine
	Haloperidol
	Haloperidol lactate
	Loxapine succinate
	Molindone
	Perphenazine
	Pimozide
	Prochlorperazine
	Thioridazine
	Thiothixene
	Trifluoperazine
Second-generation (atypical) antipsychotics	Aripiprazole
	Asenapine
	Brexpiprazole
	Cariprazine
	Clozapine
	Iloperidone
	Lurasidone
	Olanzapine
	Paliperidone
	Quetiapine
	Risperidone
	Ziprasidone
Lithium salts	Lithium
	Lithium carbonate
	Lithium citrate
Psychotherapeutic combinations	Fluoxetine-olanzapine
Long-acting (depot) injectible antipsychotics	Fluphenazine decanoate
	Haloperidol decanoate
	Aripiprazole
	Aripiprazole lauroxil
	Olanzapine pamoate
	Paliperidone palmitate (1-month extended-release injection)

Type	Medication
	Paliperidone palmitate (3-month extended-release injection)
	Risperidone microspheres

5.5 Follow-Up Period

The follow-up period includes any outpatient medication filled 2 days prior to the day of discharge (Day 0) through 30 days post-discharge. Outpatient medications are defined as a medication on the numerator list filled through Parts A, B, and D.

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Appendix 1. List of Acronyms and Abbreviations

AHRQ	Agency for Healthcare Research and Quality
APA	American Psychiatric Association
CI	Confidence interval
CMS	Centers for Medicare & Medicaid Services
CPT	Current procedural terminology
ECT	Electroconvulsive therapy
FDA	Food and Drug Administration
FFS	Fee-for-service
HEDIS	The Healthcare Effectiveness Data and Information Set
HSAG	Health Services Advisory Group, Inc.
ICD-9-CM	International Classification of Diseases, Ninth Revision, Clinical Modification
ICD-10	International Classification of Diseases, 10th Revision, Clinical Modification
IPF	Inpatient psychiatric facility
IPFQR	Inpatient Psychiatric Facility Quality Reporting
IPPS	Inpatient Prospective Payment System
LAI	Long-acting injectable
Max	Maximum
MDD	Major depressive disorder
Min	Minimum
NDC	National Drug Code
NQF	National Quality Forum
OR	Odds ratio
Pctl	Percentile
SD	Standard deviation
SNRI	Selective serotonin reuptake inhibitors
SSRI	Serotonin norepinephrine reuptake inhibitors
TEP	Technical expert panel
TMS	Transcranial magnetic stimulation
VA/DoD	Department of Veterans Affairs/Department of Defense

Appendix 2. Diagnosis Frequencies

Table 31. Frequency of Diagnosis Codes for MDD

Description	ICD-9-CM-Codes	Frequency	Percent of Cohort n=930,777
Major depressive disorder, single episode	296.20 – 296.25	28,387	3.05
Major depressive disorder, recurrent episode	296.30 – 296.35	96,463	10.36
Depressive type psychosis	298.0	95	0.01
Depressive disorder, not elsewhere classified	311	20,798	2.23
Total		145,743	15.66

Table 32. Frequency of Diagnosis Codes for Schizophrenia

Description	ICD-9-CM-Codes	Frequency	Percent of Cohort n=930,777
Schizophrenic disorders	295	0	
Schizophrenic disorders, simple type	295.0, 295.00 – 295.05	168	0.02
Schizophrenic disorders, disorganized type	295.0, 295.10 – 295.15	2,841	0.31
Schizophrenic disorders, catatonic type	295.2, 295.20 – 295.25	650	0.07
Schizophrenic disorders, paranoid type	295.3, 295.30 – 295.35	72,442	7.78
Schizophrenic disorders, schizophreniform disorder	295.4, 295.40 – 295.45	520	0.06
Latent schizophrenia	295.5, 295.50 – 295.55	64	0.01
Schizophrenic disorders, residual type	295.6, 295.60 – 295.65	5,245	0.56
Schizoaffective disorder	295.7, 295.70 – 295.75	124,850	13.41
Other specified types of schizophrenia	295.8, 295.80 – 295.85	1,452	0.16
Unspecified schizophrenia	295.9, 295.90 – 295.95	19,358	2.08
Total		227,590	24.45

Table 33. Frequency of Diagnosis Codes for Bipolar Disorder

Description	ICD-9-CM-Codes	Frequency	Percent of Cohort n=930,777
Bipolar I disorder, single manic episode	296.00 – 296.06	1,077	0.12
Manic disorder, recurrent episode	296.10 - 296.16	93	0.01
Bipolar I disorder, most recent episode (or current) manic	296.40 – 296.46	29,717	3.19
Bipolar I disorder, most recent episode (or current) depressed	296.50 – 296.56	42,046	4.52
Bipolar I disorder, most recent episode (or current) mixed	296.60 – 296.66	24,775	2.66
Bipolar I disorder, most recent episode (or current) unspecified	296.7	4,502	0.48
Other and unspecified bipolar disorders	296.80 – 296.82, 296.89	36,241	3.89
Total		138,451	14.87