# Assessing Health Care Utilization and Costs Among Hospital-Discharged Patients With Schizophrenia

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## BACKGROUND

- Patients discharged following a schizophrenia-related inpatient admission often face challenges transitioning to the community, which may result in homelessness, social isolation, unemployment, imprisonment, and, often, rehospitalization.[1,2]

- Patients with schizophrenia with two or more relapse events (defined as a psychiatric hospitalization, use of emergency services, use of a crisis bed, or a suicide attempt) incurred five times greater health care costs compared with patients without a relapse ($50,986 vs. $10,352). The first relapse episode was the most significant predictor of a second schizophrenia relapse event (odds ratio: 4.23; 95% confidence interval [CI]: 2.41-7.44).[3]

- Following hospital discharge, patients with schizophrenia are expected to have a high likelihood of rehospitalization and to incur significant health care costs as they transition to community care.

- However, a paucity of data exists assessing the risk of rehospitalization and the associated economic burden across various clinically relevant postdischarge follow-up periods among schizophrenia patients.

- It is useful to know how the cost burden is distributed over time after the index event to assist in the evaluation of therapeutic interventions.

## OBJECTIVE

- The objective of this study was to assess health care utilization and costs during postdischarge periods (i.e., 0-60, 61-120, 121-180, 181-240, 241-300, 301-365 days) among Medicaid-enrolled patients with schizophrenia.

## METHODS

### Study Design and Data Source

- Retrospective longitudinal cohort analysis of the MarketScan Multi-State Medicaid Database for the period January 1, 2004, to December 31, 2008.

- Data consist of medical (e.g., inpatient, outpatient, physician office, and ancillary services) and pharmacy claims and associated costs for Medicaid enrollees from 11 states. For confidentiality purposes, information on the states contributing data to this database was not available to the researchers.

- Database also contains information on patient characteristics, including demographic details (e.g., age, sex, health coverage, and race) and Medicaid enrollment.

- Unique encrypted enrollee identifiers in the database allow patients to be tracked longitudinally.

### Study Cohort

- The study cohort was selected using the following inclusion and exclusion criteria.

#### Inclusion Criteria

- Schizophrenia-related inpatient admission (i.e., primary diagnosis) between July 1, 2004, and December 31, 2007, and associated hospital discharge on or before December 31, 2007

- Continuous Medicaid enrollment during the 6-month period before the index admission date, during the index inpatient admission, and during the 12-month period after the index discharge date
  – Index admission date: date of the first observed inpatient admission
  – Index discharge date: date of discharge associated with the index admission

- At least one outpatient or physician office visit with primary schizophrenia diagnosis, or more than two prescription claims for first- or second-generation antipsychotic medications during the 6-month period before the index admission date or 12-month period after the index discharge date

#### Exclusion Criteria

- Patients with schizophrenia-related inpatient admissions (secondary diagnosis) during the 6-month period prior to the index admission date

- Patients with at least one primary diagnosis claim for bipolar or schizoaffective disorder, or more than two primary diagnoses claims for unipolar disorder during the 12-month period following the index date

- Patients aged 18 years or younger at their index admission date and patients aged 65 years or older at their follow-up end date

- Patients with dual eligibility (i.e., Medicaid and Medicare)

- Patients without mental health and substance abuse (MHSA) coverage

### Study Measures

- We assessed the following study measures during the previously stated clinically relevant postdischarge follow-up periods:
  – Overall (i.e., all-cause) and schizophrenia-related health care utilization and costs were assessed for care settings including inpatient, outpatient, physician office, emergency department (ED), pharmacy, and ancillary care.
    - Schizophrenia-related utilization was defined as medical claims where schizophrenia was reported as the primary diagnosis (ICD-9 CM: 295.xx, except 295.7x) or pharmacy claims for first- or second-generation antipsychotics.
  – Health care utilization was further documented as follows:
    - The percentage of patients with one or more claims for the above outlined care settings
    - The number of unique inpatient admissions that occurred during a follow-up period (i.e., regardless of admission and discharge dates, provided the patient was hospitalized during the follow-up period); using this approach, an inpatient admission that spanned more than one follow-up period was counted n times, once for each of the n follow-up periods that the admission spanned
    - Mean length of stay (LOS)
    - Mean number of physician office, outpatient, and other ancillary care encounters and pharmacy claims and unique ED claims
  – Costs associated with health care utilization were assessed and adjusted to 2010 US dollars using the medical care component of the Consumer Price Index.
  – In cases where an inpatient stay spanned two or more follow-up time periods, we calculated a per-day cost (i.e., total cost for the inpatient episode ÷ LOS) for each inpatient episode. We then assigned costs to each follow-up period, based on the LOS in that period.

### Primary Independent Variable

- Indicators for follow-up period served as primary independent variables, and all the study measures were compared between each adjacent 60-day follow-up period.

- For example, comparing inpatient costs during the period 0-60 days versus 61-120 days, the study period indicator was considered 1 if the study period was 61-120 days and 0 if the study period was 0-60 days (i.e., reference category).

### Other Covariates

- Patient characteristics included age, sex, race, health plan type, basis of Medicaid eligibility, MHSA coverage, and index hospitalization discharge status.

- Baseline comorbidity burden was assessed using the Deyo-adapted Charlson Comorbidity Index (CCI) score.

- We also assessed adherence to antipsychotic therapy using the adherence measure proportion of days covered (PDC) calculated as:
  – PDC = total days of drug availability (days supply) in the follow-up period ÷ (number of days in the follow-up period - days hospitalized during the follow-up period).

- As a proxy for disease severity, we assessed preindex period all-cause total health care costs.[4,5]

### Statistical Analyses

- Descriptive statistics were generated for all study measures, which included frequency distributions for categorical variables and mean values, and standard deviations for continuous variables.

- We used paired t-tests to compare univariate (i.e., unadjusted) differences in continuous measures of interest (e.g., number of physician office visits) and McNemar's test for categorical measures of interest (e.g., had a physician office visit) for the postindex periods.

- Covariate-adjusted multivariable regression analyses were conducted to assess differences in health care utilization and costs between the study periods of interest.
  – For count data (e.g., number of physician office visits), we used repeated measures Poisson or negative binomial regression models. The selection of Poisson or negative binomial regression models was based on the model fit assessed using a Pearson chi-square test.
  – For dichotomous measures (e.g., had a physician office visit), we used repeated measures logistic regression models.
  – For costs outcomes (e.g., all-cause physician office visits costs), we used repeated measures generalized linear models (GLMs) with a log-link function and gamma distribution.
  – No adjustment was made for multiplicity.

## RESULTS

### Patient Characteristics

- 2,541 hospital-discharged schizophrenia patients met all study inclusion criteria; of these, over 56% were male and approximately 60% were black.

- Mean (standard deviation [SD]) age of patients was 41.17 (12.18) years, and the mean CCI score for the cohort was 0.87 (1.56).

- Approximately 61% of patients had fee-for-service health coverage, and over 94% had "blind/disabled individual" as the reason for basis of Medicaid eligibility.

- Over 88% were "discharged to home self-care."

### Unadjusted Health Care Utilization and Costs (Figure 1)

- Compared with the 0-60–day period, for the 61-120–day period we found that:
  – All-cause utilization significantly declined for various care settings, including inpatient visits ($P < 0.001$), physician office visits ($P = 0.008$), ED visits ($P < 0.001$), and pharmacy claims ($P < 0.001$).
  – Schizophrenia-related utilization significantly declined for various care settings, including inpatient visits ($P < 0.001$), hospital outpatient visits ($P < 0.001$), ED visits ($P = 0.009$), and pharmacy claims ($P < 0.001$).
  – A significantly lower proportion of patients had at least one schizophrenia-related rehospitalization episode (10.04% vs. 13.85%; $P < 0.001$).
  – Schizophrenia-related total medical costs significantly decreased ($2,102 vs. $2,708; $P < 0.001$), with rehospitalization (mean $660 vs. $978; $P < 0.001$) and pharmacy (mean $743 vs. $959; $P < 0.001$) costs being the two care settings with significant decline in costs.
  – All-cause health care costs declined by 24% ($776), of which 78% ($606) was attributable to the decline in schizophrenia-related utilization.

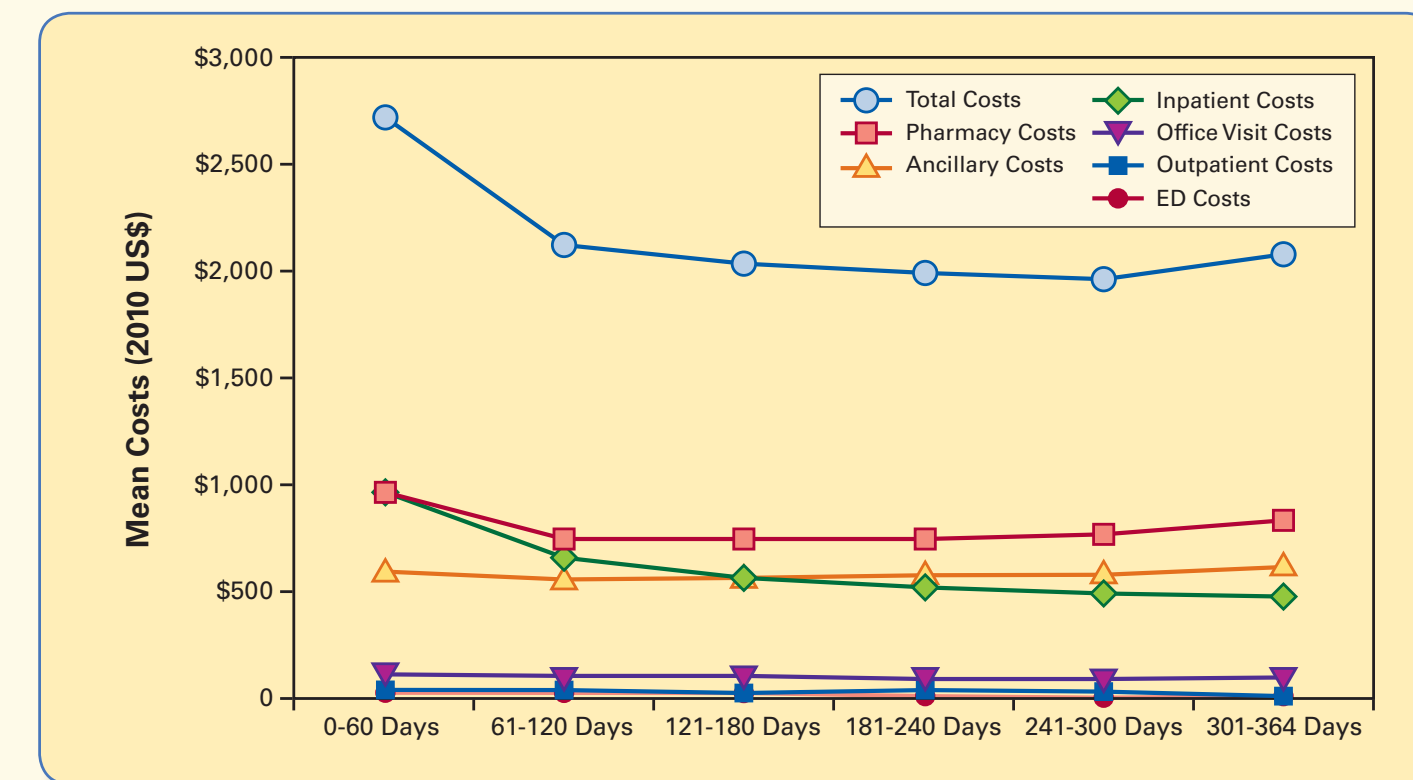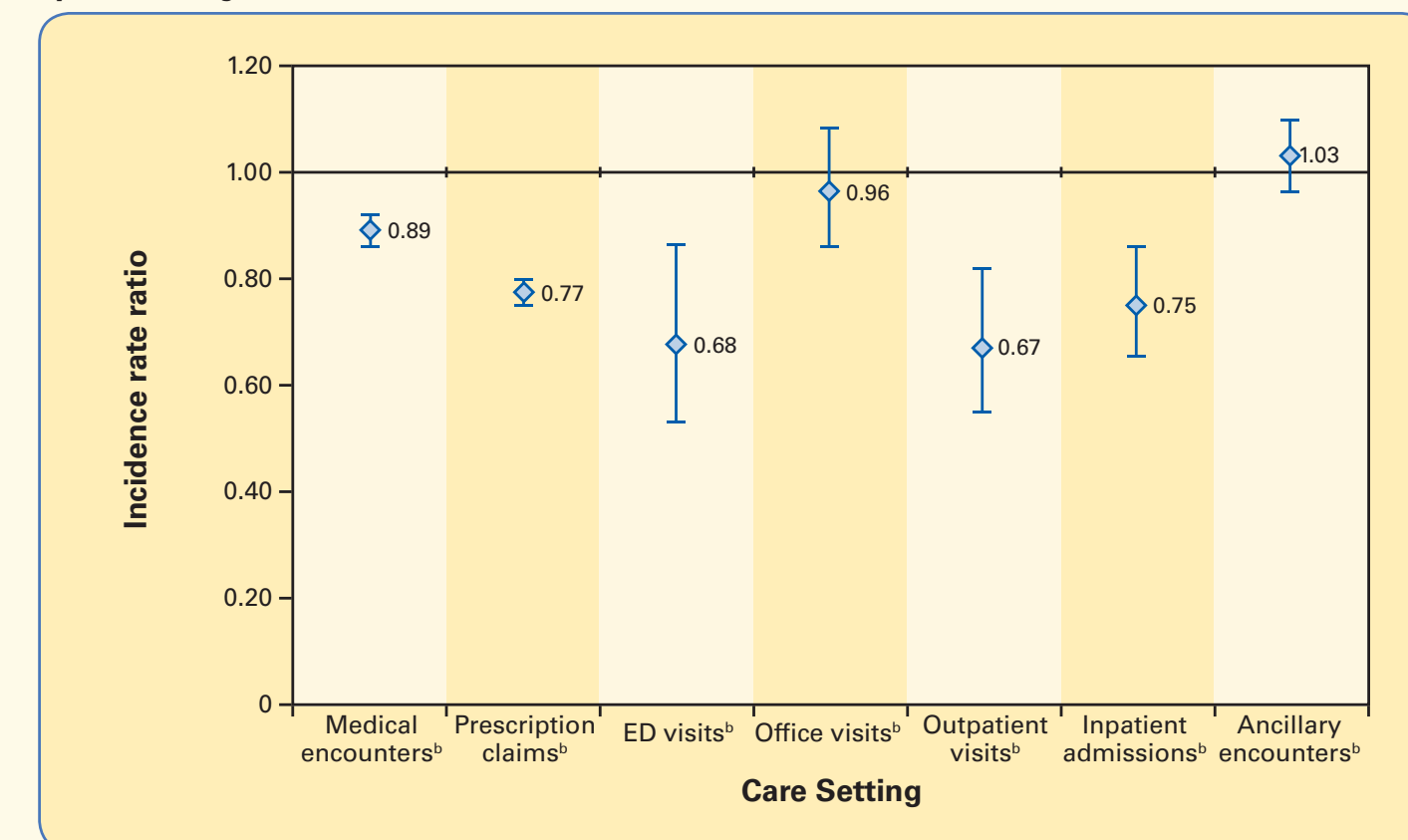**Figure 1. Follow-up Period Unadjusted Schizophrenia-Related Health Care Costs, by Care Settings**



**Figure 2. Follow-up Period Risk-Adjusted IRRs[a] for Schizophrenia-Related Health Care Utilization, by Care Setting**



[a]IRR based on negative binomial or Poisson regression model, adjusted for study period and other relevant covariates (i.e., sex, race, age, CCI score, plan type, discharge status, antipsychotic adherence, preindex period health care cost).

[b]Negative binomial regression model. Graph presents incidence rate ratio and corresponding 95% confidence intervals.

- Overall, the proportion of patients with schizophrenia-related rehospitalization steadily declined (0-60 days: 13.85%; 61-120 days: 10.04%; 121-180 days: 9.33%; 181-240 days: 7.95%; 241-300 days: 7.52%; 301-364 days: 7.56%).

- Overall, following the initial 60-day period, both all-cause (mean costs: 0-60 days: $4,514; 61-120 days: $3,738; 121-180 days: $3,577; 181-240 days: $3,713; 241-300 days: $3,726; 301-364 days: $3,984) and schizophrenia-related (mean costs: 0-60 days: $2,708; 61-120 days: $2,102; 121-180 days: $2,018; 181-240 days: $1,983; 241-300 days: $1,957; 301-364 days: $2,068) costs declined during the 61-120–day period and remained stable for the subsequent postdischarge periods.

### Covariate-Adjusted Health Care Utilization and Costs (Table 1, Figure 2)

- Compared with the 0-60–day period, for the 61-120–day period we found that:
  – The covariate-adjusted rate of schizophrenia-related rehospitalization was significantly lower (incidence rate ratio [IRR]: 0.748; 95% CI: 0.652-0.857).
  – Covariate-adjusted all-cause costs were significantly lower for various care settings, including pharmacy (mean $1,438 vs. $1,246; $P < 0.001$), physician office (mean $385 vs. $378; $P < 0.001$), hospital outpatient (mean $478 vs. $441; $P < 0.001$), inpatient (mean $7,676 vs. $7,336; $P < 0.001$), and total medical costs (mean $4,606 vs. $3,966; $P < 0.001$).
  – Covariate-adjusted schizophrenia-related costs were significantly lower for various care settings, including pharmacy (mean $1,067 vs. $949; 0.001), physician office (mean $540 vs. $528; $P < 0.001$), hospital outpatient (mean $540 vs. $425; $P < 0.001$), inpatient (mean $6,991 vs. $6,481; $P < 0.001$), and total medical costs (mean $2,837 vs. $2,457; $P < 0.001$).

- No significant differences in covariate-adjusted rate of schizophrenia-related rehospitalization were observed for other study periods.

**Table 1. Covariate-Adjusted All-Cause and Schizophrenia-Related Costs, by Care Setting (Follow-up Period: 0-60 Days Versus 61-120 Days)**

| Cost Outcome, by Care Setting | Mean Predicted Cost[a] | | Mean Difference | 95% CI | | P Value |
|---|---|---|---|---|---|---|
| | 0-60 Days | 61-120 Days | | | | |
| **Medical costs** | | | | | | |
| All-cause | $4,606 | $3,966 | $640 | $608 | $671 | < 0.001 |
| Schizophrenia-related | $2,837 | $2,457 | $380 | $362 | $398 | < 0.001 |
| **Pharmacy costs** | | | | | | |
| All-cause | $1,438 | $1,246 | $192 | $181 | $203 | < 0.001 |
| Schizophrenia-related | $1,067 | $949 | $119 | $112 | $126 | < 0.001 |
| **ED costs** | | | | | | |
| All-cause | $490 | $512 | -$21 | -$22 | -$21 | < 0.001 |
| Schizophrenia-related | $367 | $379 | -$12 | -$12 | -$11 | < 0.001 |
| **Office visit costs** | | | | | | |
| All-cause | $385 | $378 | $7 | $6 | $7 | < 0.001 |
| Schizophrenia-related | $540 | $528 | $12 | $10 | $14 | < 0.001 |
| **Outpatient visit costs** | | | | | | |
| All-cause | $478 | $441 | $37 | $36 | $38 | < 0.001 |
| Schizophrenia-related | $540 | $425 | $115 | $109 | $121 | < 0.001 |
| **Inpatient visit costs** | | | | | | |
| All-cause | $7,676 | $7,336 | $340 | $322 | $358 | < 0.001 |
| Schizophrenia-related | $6,991 | $6,481 | $510 | $497 | $522 | < 0.001 |
| **Ancillary encounters costs** | | | | | | |
| All-cause | $1,546 | $1,552 | -$6 | -$11 | $0 | 0.039 |
| Schizophrenia-related | $1,104 | $1,147 | -$42 | -$49 | -$36 | < 0.001 |

[a]Predicted cost based on GLM model, adjusted for follow-up period and other relevant covariates (i.e., sex, race, age, CCI score, plan type, discharge status, antipsychotic adherence, preindex period health care cost).

## LIMITATIONS

- Identification of schizophrenia patients was based on ICD-9-CM and national drug codes, and any coding inaccuracies by health care providers may lead to misidentification of patients as having schizophrenia.

- We used the Medicaid paid amount in assessing the economic burden and did not account for patients' out-of-pocket expenses (e.g., copayment, coinsurance, health savings account), which may underestimate the total direct economic burden.

- The data do not include information on certain factors, such as medication side effects, occupational status, education level, and income, which may have an effect on postdischarge health care utilization and costs.

- Details on medications used during an inpatient stay were not available.

- These findings may not be generalizable to individuals enrolled in other federal (e.g., Medicare, Veterans Administration) or commercial health plans, or to individuals without health coverage. Moreover, we used several inclusion and exclusion criteria, such as continuous Medicaid enrollment, which may also limit generalizability.

## DISCUSSION AND CONCLUSIONS

- To the best of our knowledge, this is the first study to assess real-world trends in health care utilization and costs at various clinically relevant posthospital discharge periods among patients experiencing schizophrenia-related inpatient admission.

- Significantly greater schizophrenia-related health care utilization and associated costs were observed during the initial 60 days following hospital discharge, with pharmacy and rehospitalization being the main drivers of the greater costs.

- These findings suggest that hospital-discharged schizophrenia patients are at an increased risk of rehospitalization as they transition to the community setting, which in turn exerts a greater economic burden on the Medicaid system.

- Further research is required to better understand factors associated with greater health care resource consumption during the initial 60-day period following discharge.

- Additional research may also help physicians craft tailored management and treatment strategies to help mitigate the economic and humanistic burden of illness in patients with schizophrenia.

## REFERENCES

Please see handout for a complete reference list.

## CONTACT INFORMATION

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Presented at: 2011 US Psychiatric and Mental Health Congress
November 7-10, 2011
Las Vegas, NV, United States