Impact of Negative Symptoms on Healthcare Resource Utilization and Costs in Schizophrenia: A Real-World Data Analysis

ASCP W86

Nadia Lipunova,[1] Joannes Yeow,[1] Laila Hadaya,[1] Emily O.C. Palmer,[1] Subina Surendran,[1] Kristin Gillard,[2] Christoph U. Correll[3-5]

[1]Holmusk Technologies, UK, USA, and Singapore; [2]Bristol Myers Squibb, Princeton, NJ, USA; [3]The Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, Psychiatry Research, Hempstead, NY, USA; [4]Feinstein Institute for Medical Research, Manhasset, NY, USA; [5]Charité Universitätmedizin, Berlin, Germany

Introduction

- Negative symptoms in schizophrenia (NSS), including avolition, anhedonia, and reduced emotional expression,[1] affect approximately 60% of individuals and are associated with significant functional impairment[2-4]
- Understanding the impact of negative symptoms on healthcare resource utilization (HCRU) and economic burden in patients with schizophrenia is crucial for healthcare systems to optimize resource allocation and develop targeted interventions

Objective

- To estimate the association between negative symptoms and inpatient, outpatient, and emergency visits and costs among patients with schizophrenia both overall and because of psychiatry-related and non-psychiatry-related reasons during a 12-month follow-up

Methods

Study design and data source

- This retrospective cohort study analyzed electronic health records from NeuroBlu Data (V24R5) linked to the Inovalon MORE2 Registry® of Closed Claims and the 100% Medicare fee-for-service databases
- NeuroBlu Data, a de-identified, longitudinal behavioral health real-world database, comprises structured and unstructured patient-level records from US mental healthcare providers spanning from 1999–2024; Inovalon, a real-world database, includes medical and pharmacy closed claims from 2019–2024

Study population

- Patients were included if further conditions were met:
  - A recorded diagnosis of schizophrenia in the NeuroBlu Data dataset
  - At least 1 record the following: Mental Status Examination (MSE), negative symptoms label extracted via Natural Language Processing (NLP), or Brief Negative Symptoms Assessment (BNSA) within ±14 days of a diagnosis of schizophrenia
  - Aged ≥18 years at the time of the MSE/NLP/BNSA assessment
  - A record of the payer plan period throughout the 12-month follow-up in the Inovalon claims dataset

Exposure

- The exposure of interest was NSS. Patients were classified as having evidence of negative symptoms if any of the following conditions were met: (1) BNSA total score ≥9 points; (2) NLP label indicating presence of negative symptoms; or (3) MSE documentation of negative symptoms. All conditions were assessed within a time window of ±14 days around a diagnosis of schizophrenia to ensure clinical relevance of recorded symptoms. If multiple conditions were met, the earliest record by date was selected as the index event

Outcomes

- The study outcomes were healthcare visit counts and costs for inpatient, outpatient, and emergency department care during the 12-month follow-up period; visit counts and costs were stratified into psychiatry-related and non-psychiatry-related visit subgroups. Psychiatry-related visits included those occurring in a psychiatric setting (psychiatric departments or provider specialties) or having associated psychiatric diagnostic codes, procedures, prescriptions, or clinical measurements; non-psychiatry-related visits encompassed all other healthcare activity

Covariates

- Potential confounders, used in both propensity score assessment and regression adjustment, included demographics (age, sex, race, and ethnicity) and clinical characteristics (care setting, psychiatric and medical comorbidities, presence of positive symptoms, cognitive impairment, psychopharmacological treatments, and insurance type)

Statistical analysis

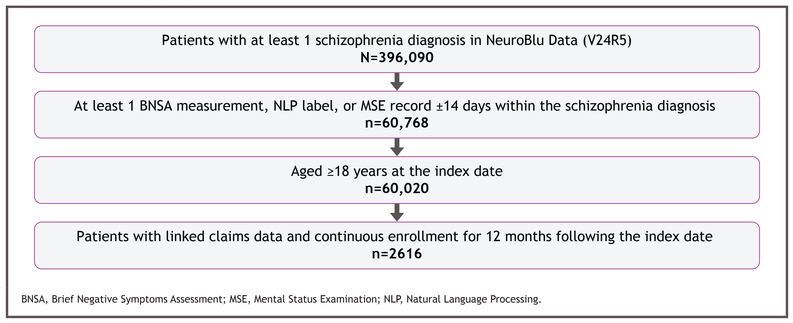
- Descriptive statistics were calculated for all variables, with continuous variables summarized using medians and interquartile range, and categorical variables summarized using absolute counts and percentages
- Stabilized inverse probability treatment weighting (IPTW) was used to create balanced cohorts between patients with and without negative symptoms; propensity scores were estimated using logistic regression and included all listed covariates
- Extreme weights below the 1st percentile or above the 99th percentile were trimmed to prevent disproportionate influence of outlier observations
- Covariate balance was assessed using standardized mean differences for continuous variables and raw mean differences for categorical variables, with differences ≤0.1 considered adequately balanced
- Negative binomial regression models with zero-inflation models, where needed, and IPTW were used to calculate incidence rate ratios for HCRU outcomes, adjusted for baseline demographics and clinical characteristics, psychopharmacological treatments, and insurance type; cost ratios were estimated using gamma regression with zero-inflation models and IPTW, adjusting for the same covariates
- HCRU and cost outcomes were presented as incidence rate ratios and cost ratios, respectively, with 95% confidence intervals; ratios >1.0 indicate higher service use and cost among patients with negative symptoms, ratios <1.0 indicate lower service use and cost, and ratios of 1.0 indicate no difference compared with patients without negative symptoms

Results

Study population

- The linked claims cohort included 2616 adults (1774 [68%] with NSS) (**Figure 1**)
- After IPTW, the cohort had an effective sample size (ESS) of 1676 patients (1282 [77%] with NSS); the ESS for the weighted analysis is lower than the nominal population size, meaning that the propensity score weighted analyses have approximately the same statistical power as an unweighted sample with 1676 individuals

Figure 1. Study population flowchart



BNSA, Brief Negative Symptoms Assessment; MSE, Mental Status Examination; NLP, Natural Language Processing.

Descriptive characteristics

- **Table 1** shows baseline characteristics after applying IPTW
- The ESS represents the number of independent observations required by an unweighted sample to obtain the same level of precision achieved after applying IPTW; it is a measure of statistical information rather than a participant count, and therefore the subgroup ESS values do not sum to the total

Table 1. Population characteristics after weighting[a]

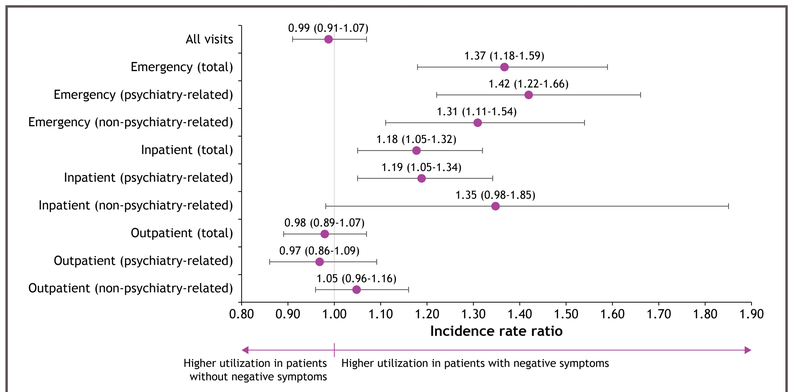
Variable	With NSS (ESS=1282)	Without NSS (ESS=394)	SMD/RMD
Age at baseline, years			
Median (Q1, Q3)	38 (28, 54)	39 (27, 52)	-
Sex, n (%)			
Female	714 (40)	320 (43)	0.02
Male	1052 (60)	428 (57)	
Race, n (%)			
Black or African American	880 (50)	396 (53)	<0.01
White	651 (37)	247 (33)	0.03
Other race	111 (6)	49 (7)	<0.01
Unknown	124 (7)	55 (7)	0.04
Ethnicity, n (%)			
Not Hispanic or Latino	1032 (58)	429 (57)	0.01
Hispanic or Latino	68 (4)	27 (4)	<0.01
Unknown	666 (38)	292 (39)	0.01
Clinical setting at index date, n (%)			
Inpatient visit	472 (27)	130 (17)	0.09
Outpatient visit	1094 (62)	418 (56)	0.06
Emergency department visit	502 (28)	268 (36)	0.07
Other setting	994 (56)	490 (66)	0.09
Symptoms, n (%)			
Positive	937 (53)	346 (46)	0.07
Cognitive impairment	1018 (58)	389 (52)	0.06
Treatment at baseline, n (%)			
Second-generation antipsychotics	1083 (61)	422 (57)	0.05
Antidepressants	886 (50)	332 (45)	0.06
First-generation antipsychotics	612 (35)	241 (32)	0.02
Comorbidities, n (%)			
Substance use disorder (or treatment)	887 (50)	341 (46)	0.05
Cardiovascular disorders (or cardiovascular treatment)	713 (40)	284 (38)	0.05
Schizoaffective disorder	330 (19)	112 (15)	0.04
Diabetes mellitus (or hypoglycemic treatment)	261 (15)	119 (16)	0.01
Major depressive disorder	252 (14)	88 (12)	0.03
Bipolar I or II disorder	161 (9)	77 (10)	0.01
Posttraumatic stress disorder	137 (8)	56 (8)	<0.01
Attention deficit hyperactivity disorder	80 (5)	37 (5)	<0.01
Generalized anxiety disorder	45 (3)	14 (2)	0.01
Borderline personality disorder	39 (2)	14 (2)	<0.01
Obsessive compulsive disorder	18 (1)	9 (1)	<0.01
Payer source, n (%)			
Medicaid	54 (3)	24 (3)	<0.01
Medicare	101 (6)	54 (7)	0.02
Commercial	1631 (92)	677 (91)	0.02

[a]Estimates have been rounded to the nearest whole number to help with interpretability.
ESS, effective sample size; NSS, negative symptoms in schizophrenia; Q, quarter; RMD, raw mean difference; SMD, standard mean difference.

HCRU

- Negative symptoms in patients with schizophrenia were statistically significantly associated with increased incidence of emergency department visits and inpatient visits (**Figure 2**)
  - Patients with negative symptoms experienced significantly more psychiatry-related and non-psychiatry-related emergency department visits and psychiatry-related inpatient visits
- No significant differences were observed in total HCRU or outpatient visit utilization between patients with or without negative symptoms (**Figure 2**)

Figure 2. Association between negative symptoms in schizophrenia and HCRU[a,b]



[a]The figure shows incidence rate ratios and 95% confidence intervals. [b]Estimates have been adjusted for demographic characteristics, clinical characteristics, and data source.
HCRU, healthcare resource utilization.

Costs

- Patients with negative symptoms had significantly higher total and outpatient costs than those without negative symptoms (**Figure 3**)
  - Negative symptoms of schizophrenia were statistically significantly associated with increased psychiatry-related outpatient costs

Figure 3. Association between negative symptoms in schizophrenia and healthcare costs[a,b]

[a]The figure shows cost ratios and 95% confidence intervals. [b]Estimates have been adjusted for demographic characteristics, clinical characteristics, and data source.

Limitations

- This study has constraints, including potential unmeasured confounding, low linkage rate between electronic health record and claims data that may limit study generalizability, and reliance on multiple routine assessments rather than a single scale (eg, MSE rather than formal assessments such as the Positive and Negative Syndrome Scale)

Conclusions

- NSS were associated with substantially increased acute HCRU overall and across psychiatry-related and non-psychiatry-related services
  - Increases in emergency department and inpatient visits in the cohort with NSS did not translate into statistically significant cost increases, suggesting that individual acute care encounters may be less resource intensive
- Total and psychiatry-related outpatient costs were higher among patients with NSS while the number of visits did not differ by NSS, suggesting that those with NSS seek more complex management in outpatient visits
- These findings highlight opportunities for targeted interventions addressing negative symptoms in schizophrenia to potentially improve care coordination, reduce healthcare costs, and enhance patient outcomes

References

1. Correll CU, Schooler NR. *Neuropsychiatr Dis Treat*. 2020;16:519-553.
2. Santesteban-Echarri O, et al. *Clin Psychol Rev*. 2017;58:59-75.
3. McGurk SR, et al. *J Neuropsychiatry Clin Neurosci*. 2000;12:257-264.
4. Rabinowitz J, et al. *Schizophr Res*. 2012;137:147-150.

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Disclosures

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