Costs of Illness Associated With Relapses in Neuromyelitis Optica Spectrum Disorder: An Administrative Claims Database Analysis

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INTRODUCTION

- Neuromyelitis optica spectrum disorder (NMOSD) is a complement-mediated, rare autoimmune disease characterized by unpredictable relapses (or attacks)[1]
- Relapses are associated with vision loss, neurological disability, and impaired mobility, and often lead to substantial healthcare resource utilization (HCRU)[2]
- Although effective treatment and management strategies are currently available to control NMOSD relapses, information on the costs associated with HCRU is limited when comparing patients with NMOSD who relapse versus those who do not relapse
- Studies aimed at comparing HCRU among these patients would help inform the clinical and economic burden of relapses in patients with NMOSD

OBJECTIVE

- To compare HCRU and associated costs for patients with NMOSD with or without a relapse

METHODS

- This retrospective cohort study evaluated administrative claims data from the Magellan database between January 1, 2016, and January 31, 2020, to identify adults (aged ≥ 18 years) with NMOSD
- Patients were grouped into 2 cohorts based on relapse status: active (≥ 1 relapse) or less active (no relapse) in the follow-up period (first claim for NMOSD [index] to study period end)
- Follow-up HCRU measures were assessed for:
  - Each encounter type
  - Annualized number of encounters by service type
  - Length of hospital stay (assessed for all patients versus those with at least 1 hospitalization)
  - Frequency and duration of attacks in those with active relapse status
- Annualized allowed costs by service type during the follow-up period were compared between the relapse and no relapse cohorts

RESULTS

- Of 132 adults included in the study, 60 had less active relapse status and 72 had active relapse status in the follow-up period (mean: 15.2 months, standard deviation [SD]: 1.9 months)
- Baseline characteristics (**Table 1**) were similar between cohorts

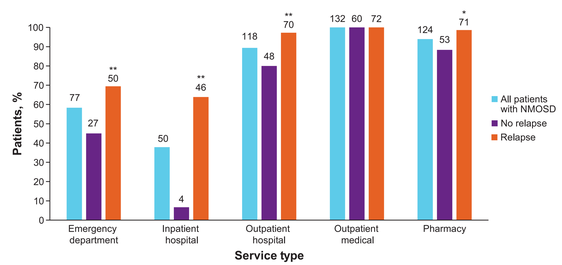
Table 1. Baseline clinical and demographic characteristics of patients with a diagnosis of NMOSD

Parameters	All Patients With NMOSD (n = 132)	No Relapse (n = 60)	Relapse (n = 72)	*P* Value[a]
Gender, n (%)				0.2493
Female	97 (73.48)	47 (78.33)	50 (69.44)	
Male	35 (26.52)	13 (21.67)	22 (30.56)	
Age, n (%)				0.5604
18–30	17 (12.88)	8 (13.33)	9 (12.50)	
31–40	34 (25.76)	12 (20.00)	22 (30.56)	
41–50	35 (26.52)	17 (28.33)	18 (25.00)	
51–64	45 (34.09)	23 (38.33)	22 (30.56)	
65+	1 (0.76)	–	1 (1.39)	
Mean (median) [SD]	44.4 (46.0) [11.6]	45.6 (47.5) [11.9]	43.5 (43.5) [11.4]	0.3077
Follow-up months, mean (median) [SD]	15.2 (15.0) [1.9]	15.0 (15.0) [2.0]	15.3 (15.0) [1.8]	0.3259
Census region description, n (%)				0.0723
East North Central	11 (8.33)	3 (5.00)	8 (11.11)	
East South Central	20 (15.15)	7 (11.67)	13 (18.06)	
Middle Atlantic	27 (20.45)	16 (26.67)	11 (15.28)	
Mountain	3 (2.27)	–	3 (4.17)	
New England	10 (7.58)	3 (5.00)	7 (9.72)	
Pacific	3 (2.27)	–	3 (4.17)	
South Atlantic	37 (28.03)	19 (31.67)	18 (25.00)	
Unknown	9 (6.82)	6 (10.00)	3 (4.17)	
West North Central	5 (3.79)	4 (6.67)	1 (1.39)	
West South Central	7 (5.30)	2 (3.33)	5 (6.94)	
Charlson Comorbidity Index frequency, n (%)				0.2720
0	69 (52.27)	37 (61.67)	32 (44.44)	
1	27 (20.45)	10 (16.67)	17 (23.61)	
2	8 (6.06)	3 (5.00)	5 (6.94)	
3+	28 (21.21)	10 (16.67)	18 (25.00)	
Mean (median) [SD]	1.56 (0.00) [2.52]	1.25 (0.00) [2.33]	1.82 (1.00) [2.66]	0.1969
Initial misdiagnosis with multiple sclerosis, n (%)	53 (40.15)	22 (36.67)	31 (43.06)	0.4559
Baseline relapses, n (%)	50 (37.88)	13 (21.67)	37 (51.39)	0.0005

[a]Statistical tests were performed between relapse and no relapse cohorts.
NMOSD, neuromyelitis optica spectrum disorder; SD, standard deviation.

- Each cohort included patients who experienced ≥ 1 relapse during the 1-year, preindex baseline period (less active: 21.7%; active: 51.4%)
- A greater proportion of patients with active versus less active relapse status during follow-up had ≥ 1 emergency department visit (69.4% vs 45.0%, $P = 0.0046$), inpatient hospital encounter (63.9% vs 6.7%, $P < 0.0001$), outpatient hospital encounter (97.2% vs 80.0%, $P = 0.0014$), or pharmacy claim (98.6% vs 88.3%, $P = 0.0137$) (**Figure 1**, **Table 2**)
- Mean (SD) length of stay was ~4 days greater for those who relapsed during follow-up (4.1 [7.4] days) versus those who did not (0.2 [0.0] days) (**Figure 2**)
- Those with active versus less active relapse status had ~double annualized outpatient hospital encounters (mean [SD]: 9.1 [8.1] vs 5.0 [5.6]; $P = 0.0017$) and more than twice the mean annualized costs per patient ($80,228 vs $33,059; $P = 0.0023$) (**Figure 3**)
- Patients in the relapse cohort had 2 relapses, on average, and received treatment for approximately 28 days

Figure 1. Proportion of patients with NMOSD who had at least 1 encounter[a] compared by relapse status



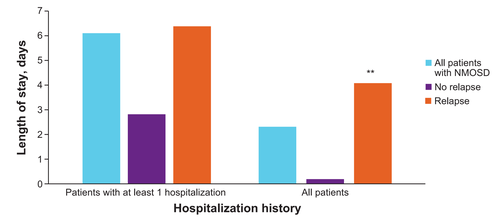
Numbers above the bars represent n values.
[a]Although the proportion of patients with different service types are significantly different, they should be interpreted with caution, as the study groups were based on follow-up period service type utilization, biasing the relapse group toward higher rates of inpatient hospital and outpatient hospital utilization.
*$P < 0.05$, **$P < 0.01$, when comparing the relapse and no relapse cohorts.
NMOSD, neuromyelitis optica spectrum disorder.

Table 2. Annualized encounters by service type

Service Type, Mean (Median) [SD]	All Patients With NMOSD (n = 132)	No Relapse (n = 60)	Relapse (n = 72)	*P* Value[a]
Emergency department	1.99 (1.41) [2.57]	1.52 (1.00) [1.40]	2.25 (1.55) [3.00]	0.1482
Inpatient hospital	1.86 (0.92) [2.18]	2.89 (1.00) [3.94]	1.77 (0.92) [2.01]	0.6135
Outpatient hospital	7.44 (5.25) [7.45]	5.03 (3.17) [5.56]	9.09 (6.40) [8.14]	0.0017
Outpatient medical	27.1 (21.2) [34.2]	22.2 (19.8) [16.5]	31.2 (24.0) [43.6]	0.1063
Pharmacy	31.0 (20.1) [30.7]	26.1 (17.1) [27.8]	34.6 (22.4) [32.5]	0.1308

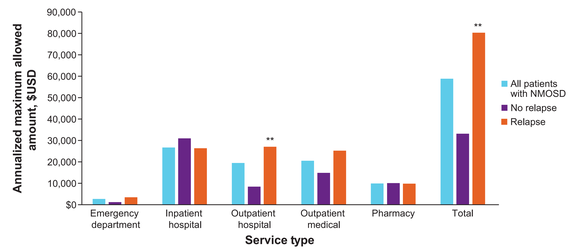
[a]Statistical tests were performed between relapse and no relapse cohorts.
NMOSD, neuromyelitis optica spectrum disorder; SD, standard deviation.

Figure 2. Length of stay, all-cause (days) by hospitalization history



**$P < 0.01$, when comparing the relapse and no relapse cohorts.
NMOSD, neuromyelitis optica spectrum disorder.

Figure 3. Annualized maximum allowed amount by service type (USD)[a]



[a]The dollar amounts represented here have not been adjusted for inflation and are actual dollar amounts during the follow-up period starting from June 1, 2019.
**$P < 0.01$, when comparing the relapse and no relapse cohorts.
NMOSD, neuromyelitis optica spectrum disorder; USD, United States dollars.

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KEY MESSAGE

Because of the significant impact relapses have on HCRU, therapeutic options focusing on reducing relapses should be considered.

CONCLUSIONS

- **Patients with NMOSD who had a relapse incurred more outpatient hospital encounters, longer lengths of stay, and greater mean annualized costs compared with patients who did not have a relapse**
- **These findings highlight the significant clinical and economic burden of relapses in NMOSD**

LIMITATIONS

- Causality cannot be determined from this study, only associations
- Some undetectable data quality issues may exist that are common to all claims data sources, such as submitting a valid code but not the code that was intended
- There are services performed but not billed that could not be captured in the data, such as physician samples for pharmaceutical products or services performed pro bono

Disclosures
Daniel Foley is an employee and stockholder of Alexion, AstraZeneca Rare Disease.
At the time of this research, Ted Williams was an employee of Magellan Rx Management.
At the time of this research, Michael Polson was an employee and stockholder of Magellan Rx Management.
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References
1. Wingerchuk DM, et al. *Neurology*. 1999;53(5):1107–1114.
2. Royston M, et al. *Neurol Ther*. 2021;10(2):767–783.

The materials listed are for example only and may be replaced with other materials

Poster
Supplementary material
Plain language summary
Narrated poster video