

HEALTH RESOURCE UTILIZATION (HRU) AND COST OF CARE (COC) IN NEUROMYELITIS OPTICA SPECTRUM DISORDERS IN THE US

Joy Gupta¹, Maureen A. Mealy¹, Michael Levy²

¹Horizon Therapeutics plc, Deerfield, IL, USA; ²Harvard Medical School and Massachusetts General Hospital, Boston MA, USA

Introduction

- Neuromyelitis optica spectrum disorder (NMOSD) is a rare autoimmune disorder of the central nervous system (CNS) characterized by recurrent inflammatory attacks that preferentially target the optic nerves (optic neuritis) and spinal cord (myelitis).¹
- Attacks may result in blindness, paralysis, and even death due to neurogenic respiratory failure. Recovery is often incomplete resulting in cumulative morbidity such as vision loss and motor dysfunction that may result in wheelchair dependence.¹
- NMOSD affects an estimated 16,000–17,000 people in the US.²
- Primary acute care treatments involve use of high-dose intravenous methylprednisolone (IVMP), intravenous immunoglobulin (IVIg), and/or plasma exchange (PLEX). Historically, preventive treatment mainly comprised of immunosuppressive or immunomodulatory medications used off-label, such as rituximab; recently three drugs were approved for an NMOSD indication: eculizumab (2019), inebilizumab (2020) and satralizumab (2020).

Objective

- From a Health Economics standpoint, NMOSD remains an under-investigated disease. We examined healthcare costs and resource utilization of patients with NMOSD prior to the introduction of new therapies.

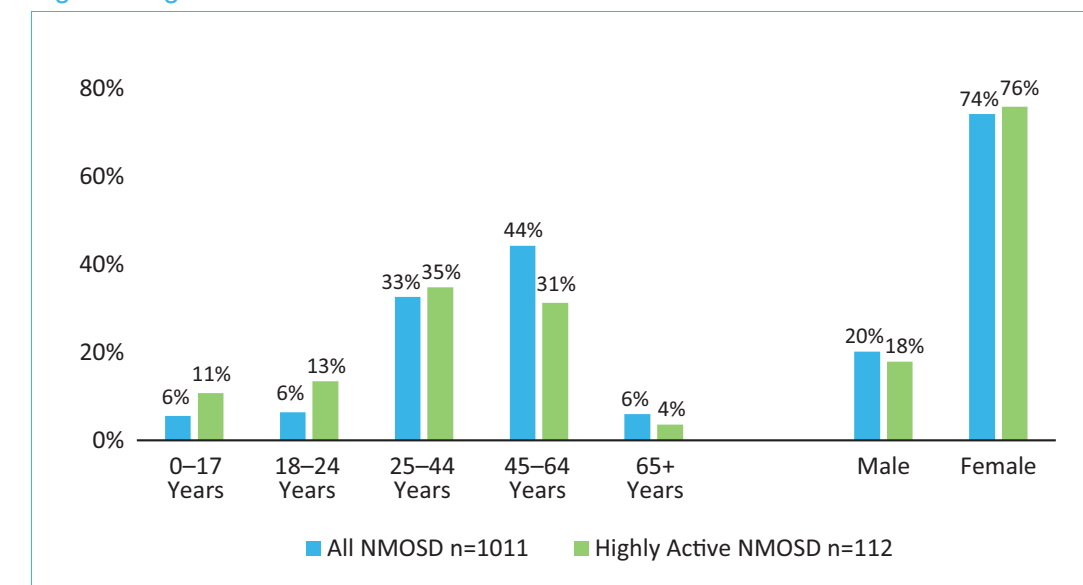
Methods

- Study Design: Retrospective review of commercial database, based on Ajmera, et al.³
- Data Source: IBM Watson Health MarketScan Commercial and Medicare Supplemental Databases (January 1, 2013 to December 31, 2017).
- Target Population: Patients with NMOSD identified based on ICD-9-CM Dx 341.0 and ICD-10-CM Dx G36.0.
- Patient Selection:
 - One or more inpatient claim for NMOSD or 2 or more outpatient claims for NMOSD (excluding rule-out claims) in the study time period
 - 18 months of continuous enrollment in medical and pharmacy benefits following the index date
 - Thus, claims data from January 1, 2013 through June 30, 2019 was used for analysis
 - A highly active NMOSD cohort was identified as a carveout: patients with 2 or more relapse events at least 28 days apart
 - A single relapse event was defined as: a primary inpatient admission for NMOSD, ≥ IVMP treatments, or ≥ 1 IVIg or PLEX treatments
- Data for NMOSD and All-cause (NMOSD and Non-NMOSD) were aggregated over an 18-month period following the Index date and reported on an annualized basis. Mean, standard deviation (SD), and median were reported for the following variables:
 - Total health expenditures, inpatient admissions, emergency room visits, office visits, pharmacy claims, lab tests, CT Scans/MRIs
 - Selected disease-related comorbidities
 - NMOSD treatments
 - Age, gender, and insurance coverage
- All expenditures were adjusted for inflation using USD 2018 values.

Results

- Using the selection criteria, a total of 1011 patients were identified, of which 112 (11%) had highly active NMOSD and 899 (89%) did not have highly active NMOSD.
- The majority of patients were female and aged 18-44 and 45-64 years (Figure 1).
- All patients had some form of insurance; 53% had PPO coverage.

Figure 1. Age & Gender



Cost Expenditures

- The mean per patient annual NMOSD expenditure for highly active NMOSD was more than 3X times higher than for the all-NMOSD population (Figure 2A), and was highest for the patients in the 0-17 years age group (Figure 2B).

Figure 2A. Per Patient Annual NMOSD and All-Cause Healthcare Expenditure (000s)

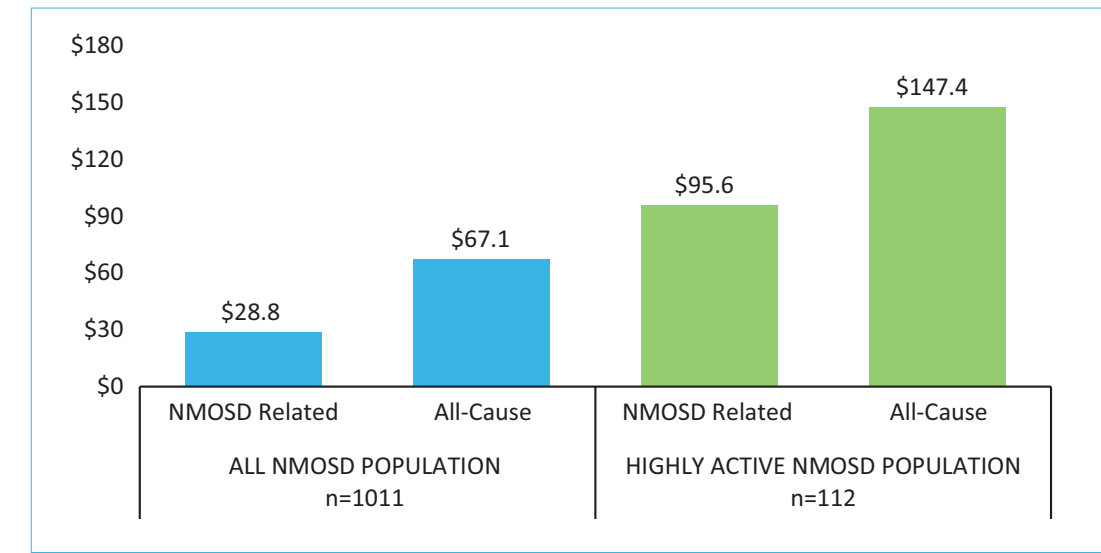
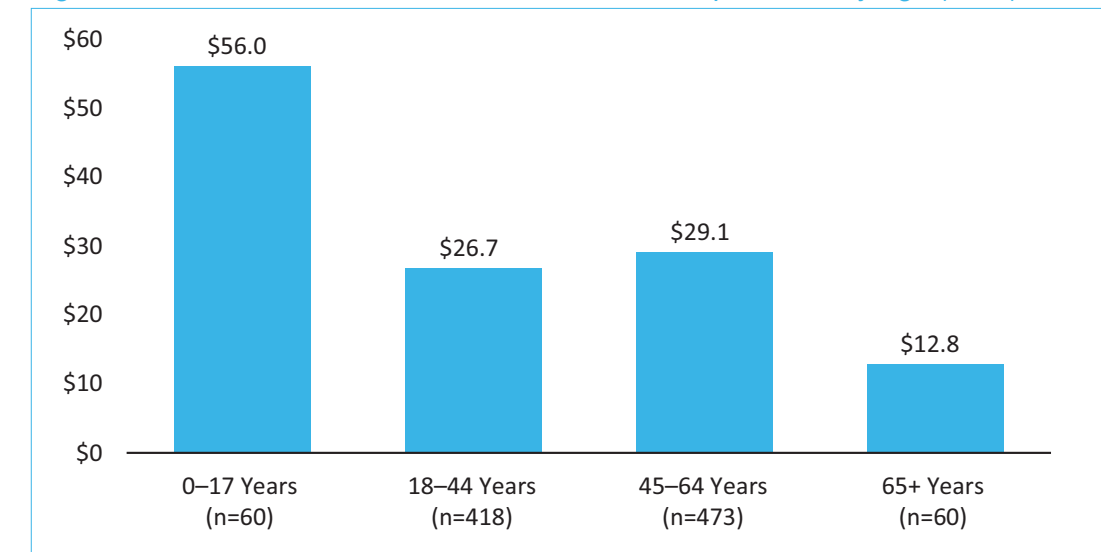


Figure 2B. Per Patient Annual NMOSD Healthcare Expenditure by Age (000s)



Health Resource Utilization

- A higher proportion of patients with highly active NMOSD had inpatient admissions annually, with higher frequency and longer duration (Table 1). These patients also had more CT/MRI scans.
- Inpatient admissions and MRI/CT scans were most frequent in the 0-17 years age group compared to the others (Table 2).

Table 1. Inpatient Admissions and CT Scans/MRIs

	Total NMOSD Population (n=1011)		Highly Active NMOSD Population (n=112)	
	NMOSD Related	All-Cause Related	NMOSD Related	All-Cause Related
Inpatient Admissions				
Patients with Inpatient Admissions Annually	23%	27%	41%	43%
Frequency/Year – Mean (SD)	1.2 (1.1)	1.4 (1.3)	2.1 (1.8)	2.4 (1.9)
Length of Stay – Mean (SD)	10.5 (18.4)	11.8 (20.9)	22.6 (33.4)	24.8 (36.4)
CT Scans/MRIs				
Patients Having CT Scans/MRIs Annual	28%	50%	38%	57%
Number/Year – Mean (SD)	1.4 (1.1)	3.9 (3.3)	1.2 (0.9)	5.5 (4.8)

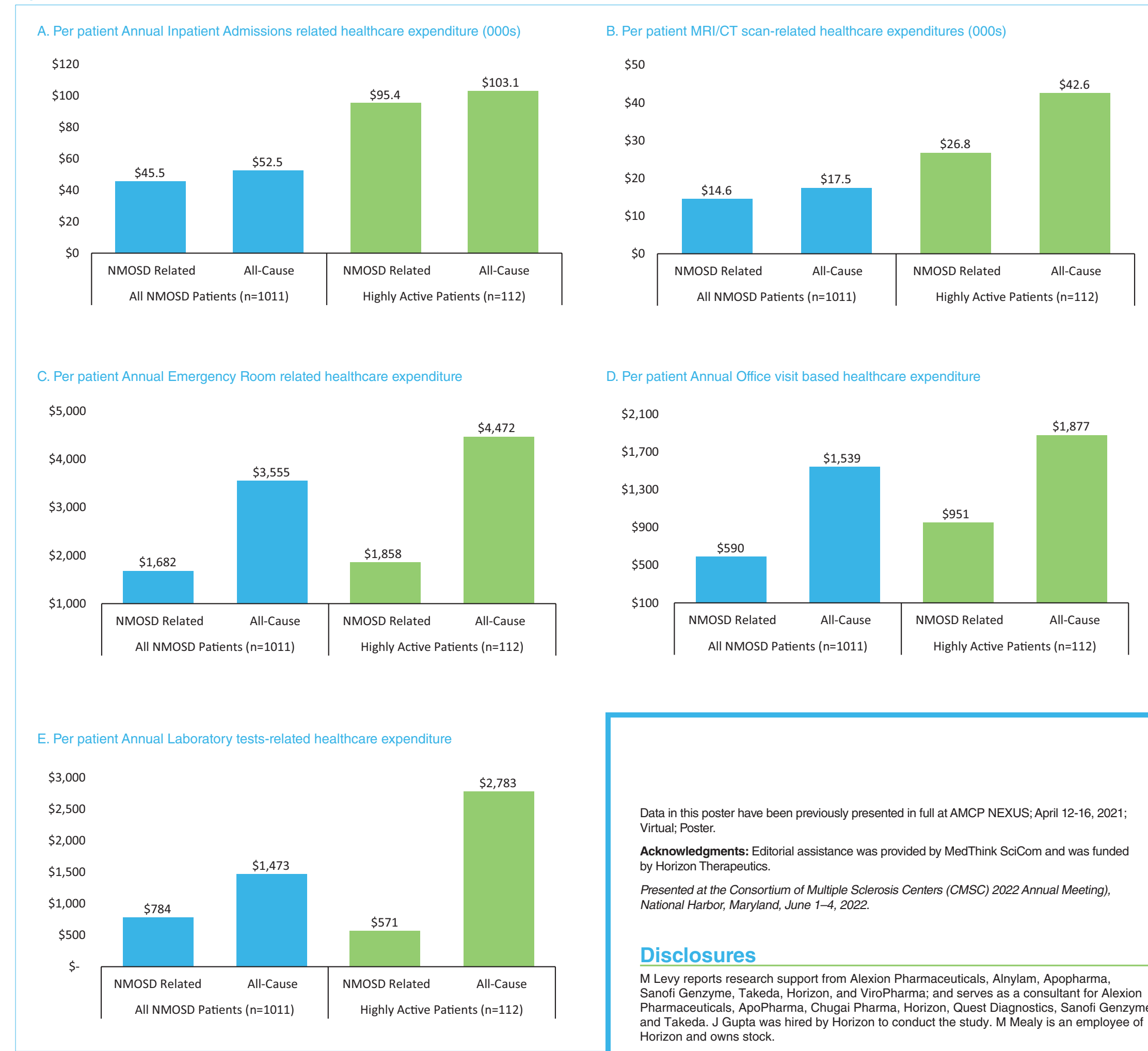
Table 2. Inpatient Admissions and CT Scans/MRIs by Age Group

	0-17 Years (n=60)	18-44 Years (n=418)	45-64 Years (n=473)	65+ Years (n=60)
Inpatient Admissions				
Frequency/Year – Mean/SD	4.0%	23%	21%	21%
Frequency/Year – Mean/SD	1.4 (1.4)	1.0 (0.8)	1.3 (1.3)	1.0 (0.9)
Length of Stay – Mean/SD	10.1 (16.0)	7.1 (9.7)	13.9 (24.8)	10.1 (9.9)
CT Scans/MRIs				
Frequency/Year – Mean/SD	46%	31%	25%	22%
Frequency/Year – Mean/SD	1.3 (0.9)	1.5 (1.1)	1.4 (1.1)	1.5 (1.1)

Direct Costs

- Drivers of direct costs were expenditures related to Inpatient visits and MRI and CT scans.
- For highly active patients vs the general NMOSD population, the cost of inpatient hospitalizations was 2X as high, and the cost of CT Scans/MRIs was 1.8X as high.
- Per capita annual inpatient admission costs (mean \$74,300) and MRI/CT scan costs (mean \$12,807) were highest in the 0-17 years age group compared to the other age groups.

Figure 3. Annual Per Capita Expenditure Drivers



Data in this poster have been previously presented in full at AMCP NEXUS; April 12-16, 2021; Virtual; Poster.

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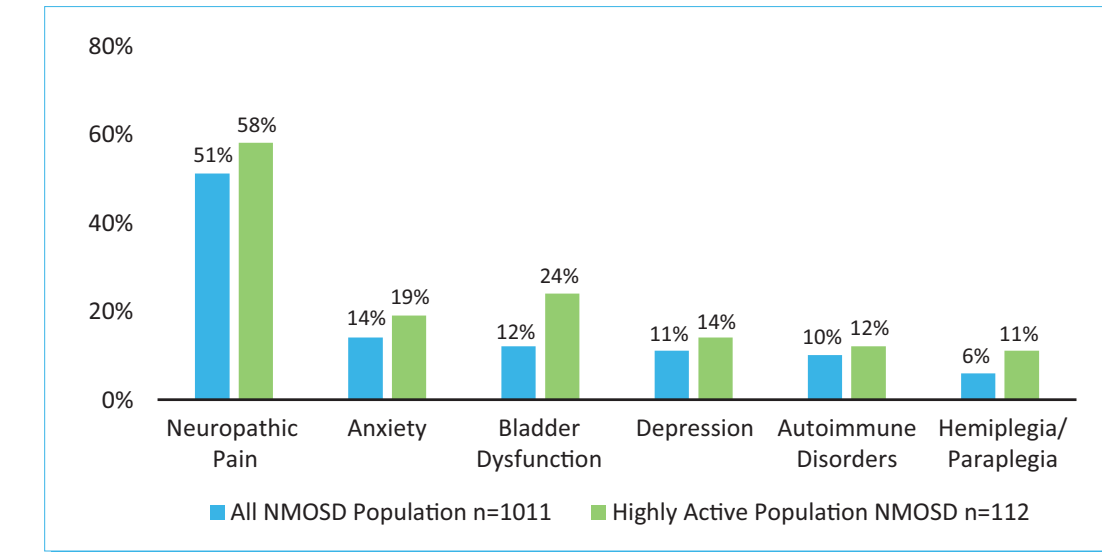
Disclosures

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Comorbidities

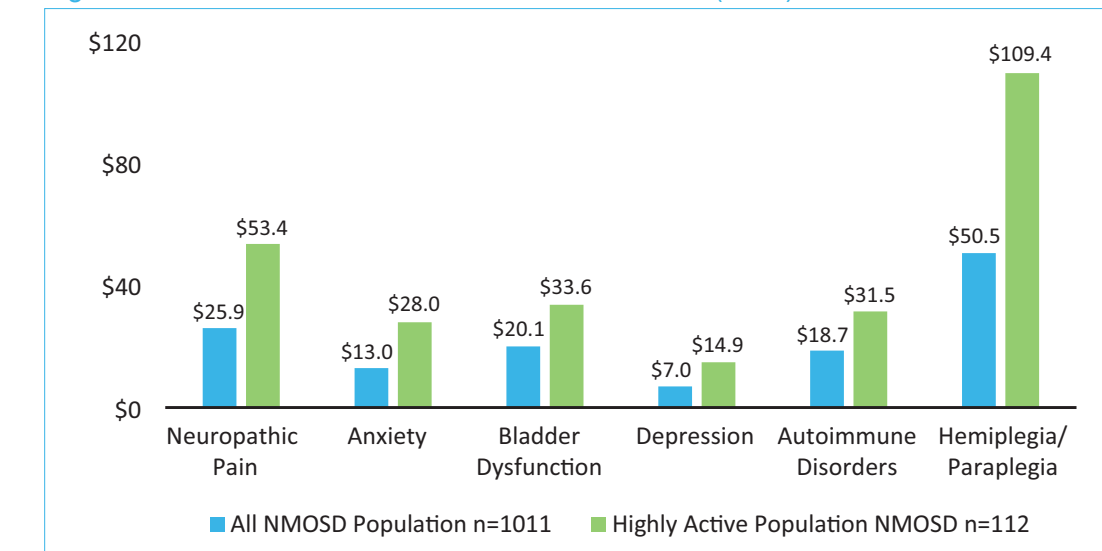
- The Charlson comorbidity index was 0.8 (SD 1.3) for all NMOSD patients and 1.5 (SD 2.2) for highly active NMOSD patients.
- Neuropathic pain was the most frequently reported comorbidity (Figure 4A). Prevalence of selected comorbidities was similar across age groups, except with auto-immune diseases, which increased with age.
- Cost of most comorbidities among highly active patients was 2X plus the general NMOSD population. Hemiplegia/paraplegia had the highest per patient cost (Figure 4B).

Figure 4A. Prevalence of Comorbidities



Autoimmune disorders include rheumatic disease, Sjögren syndrome, systemic lupus erythematosus, sarcoidosis.

Figure 4B. Per Patient Annual Cost of Comorbidities (000s)



Conclusions

- The results of this analyses provide a baseline for future assessment of the impact of newly approved therapies for NMOSD treatment on cost of care and healthcare resource utilization.
- NMOSD is associated with costly acute and preventive care, and disease monitoring. It is a significant component of all-cause healthcare expenditures of NMOSD patients.
- Primary expenditure drivers are Inpatient Admissions, CT Scans/MRIs and numerous Comorbidities which also impose significant burden on Healthcare Resources. Neuropathic Pain has the highest prevalence while Hemiplegia/Paraplegia has the highest per capita cost.
- Highly active disease adds a significant component to disease management.
- A younger NMOSD population relative to the US population, and the chronic nature of NMOSD, impacts lifetime cost of care. Patients 0-17 years have the highest overall cost and the highest Inpatient Admissions and CT Scans/MRIs.
- New treatments that reduce the need for acute care and disability accrual may positively impact lifetime cost of care and HRU. Periodic studies are recommended to monitor this impact.

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