

# The Burden of Illness Among US Veterans With Multiple Sclerosis

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## CONCLUSIONS

- Increased healthcare resource utilization patterns and costs were observed among US veterans with multiple sclerosis (MS) compared to those without MS
- The observed clinical and economic burdens associated with MS highlight the need for comprehensive healthcare management strategies and interventions that can mitigate the excess burden incurred by individuals living with this chronic condition

## BACKGROUND

- The burden of MS, a complex neurologic disease, has been increasingly recognized
- Further, the prevalence of MS has increased steadily in the US Veterans Affairs (VA) population over the past 10 years, varying substantially by age, race, and sex<sup>1</sup>
- With the rising number of veterans affected by MS and the development of new treatments in the past decade, having access to current, reliable estimates of the burden of MS in the VA population is essential

## OBJECTIVE

- To evaluate the burden of illness among patients with MS within the VA healthcare system

## METHODS

- A retrospective study was conducted to compare a cohort of patients with MS to a cohort of patients without MS using data from the VA Informatics and Computing Infrastructure
- Patients from the VA database aged ≥18 years with ≥2 MS diagnoses received ≥30 days apart between January 1, 2017–December 31, 2021, were included
- Those in the cohorts were also required to have VA enrollment 1 year pre-index and ≥1 claim after study index (index date = the first date of MS diagnosis within the period)
- Patients with MS were 1:5 propensity score matched to patients without MS on age, race, sex, and days of follow-up (exact match on age, race, and sex)
- Differences in healthcare resource utilization and costs during the 1 year follow-up were reported through incidence rate ratios (IRRs) and cost ratios, along with corresponding 95% CIs
  - Binary outcomes were modeled using logistic regression with odds ratio and 95% CI. Count outcomes were modeled using negative binomial models with IRR and 95% CI. Cost outcomes were modeled using generalized linear regressions with log link and gamma distribution with cost ratio and 95% CI

## RESULTS

- A total of 18,734 patients with MS and 93,658 patients without MS were included
- The matched cohorts had similarities in age (mean [SD] 57.1 [13.2] years), sex (78.0% male), and race distribution (18.5% Black/6.6% Other or Unknown/75.0% White) (**Table 1**)
- Mean (SD) Charlson Comorbidity Index scores were also similar between the MS cohort and non-MS cohort (0.86 [1.48] vs 0.87 [1.52]) (**Table 2**)
- Compared to the non-MS cohort, the MS cohort displayed a significantly higher number of all-cause inpatient hospitalizations (IRR [95% CI] 2.40 [2.26-2.54]), outpatient visits (IRR [95% CI] 1.59 [1.56-1.62]), emergency department visits (IRR [95% CI] 1.36 [1.31-1.42]), and pharmacy prescriptions (IRR [95% CI] 1.65 [1.62-1.68]) (**Table 3**)

## RESULTS (cont.)

**Table 1. Patient Baseline Demographic Characteristics**

Characteristics	MS Cohort (N=18,734)	Non-MS Cohort (N=93,658)	Standardized Mean Difference
<b>Age, mean (SD)</b>	57.1 (13.2)	57.1 (13.2)	0.000
<b>Female, n (%)</b>	4131 (22.1)	20,644 (22.0)	0.000
<b>Race, n (%)</b>			
Black	3463 (18.5)	17,307 (18.5)	0.000
White	14,040 (74.9)	70,199 (75.0)	0.000
Other/Unknown	1231 (6.6)	6152 (6.6)	0.000
<b>Ethnicity, n (%)</b>			
Hispanic or Latino	828 (4.4)	6178 (6.6)	0.096
Not Hispanic or Latino	17,134 (91.5)	84,057 (89.8)	0.059
Unknown/Declined to Answer	772 (4.1)	3423 (3.6)	0.024
<b>Study Index Year, n (%)</b>			
2017	15,000 (80.1)	65,932 (70.4)	0.225
2018	1660 (8.9)	10,899 (11.6)	0.092
2019	1003 (5.4)	7662 (8.2)	0.113
2020	648 (3.5)	5177 (5.5)	0.100
2021	423 (2.3)	3988 (4.3)	0.113
<b>Geographic Region, n (%)</b>			
North Central	4599 (24.6)	24,838 (26.5)	0.045
Northeast	4337 (23.2)	20,901 (22.3)	0.020
South	6477 (34.6)	34,279 (36.6)	0.042
West	3321 (17.7)	13,640 (14.6)	0.086

MS, multiple sclerosis.

**Table 2. Patient Baseline Clinical Characteristics**

Characteristics	MS Cohort (N=18,734)	Non-MS Cohort (N=93,658)	Standardized Mean Difference
<b>Charlson Comorbidity Index, mean (SD)</b>	0.86 (1.5)	0.87 (1.5)	0.012
<b>BMI Categories, n (%)</b>			
<18.5	334 (1.8)	723 (0.8)	0.090
18.5-24.9	4539 (24.2)	15,524 (16.6)	0.191
25-29.9	6598 (35.2)	31,895 (34.1)	0.025
≥30	6807 (36.3)	44,218 (47.2)	0.222
Missing	456 (2.4)	1298 (1.4)	0.076
<b>Comorbidities, n (%)*</b>			
Dyslipidemia	5962 (31.8)	38,017 (40.6)	0.183
Chronic lung disease	1533 (8.2)	10,630 (11.4)	0.107
Hypertension	6269 (33.5)	39,978 (42.7)	0.191
Diabetes mellitus	2764 (14.8)	19,481 (20.8)	0.159
Depression	4915 (26.2)	22,239 (23.7)	0.058
Anxiety disorder	2069 (11.0)	13,405 (14.3)	0.098
Ischemic heart disease	1202 (6.4)	8785 (9.4)	0.110
Migraine	1047 (5.6)	4705 (5.0)	0.025

\*Comorbidities selected from Salter A, et al. Comorbidity is associated with disease activity in MS: Findings from the CombiRx trial. *Neurology*. 2020;95(5):e446-e456. BMI, body mass index; MS, multiple sclerosis.

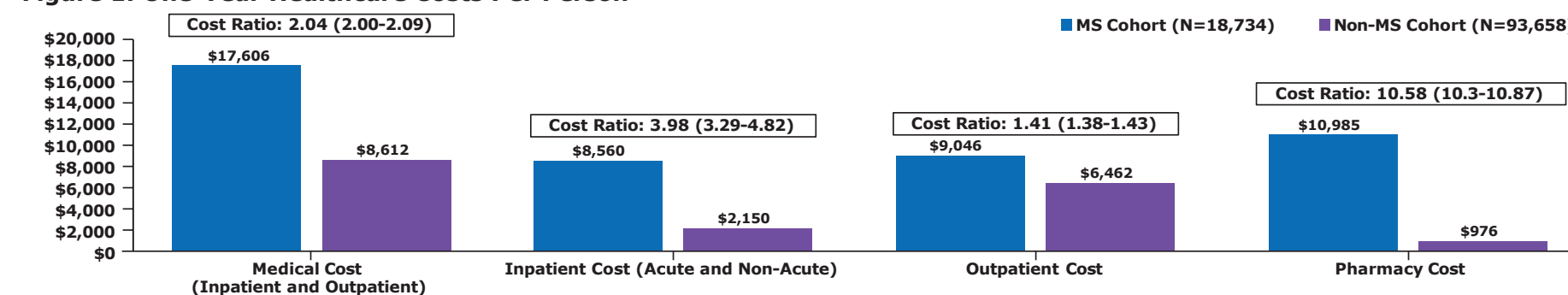
**Table 3. One-Year Healthcare Resource Use**

Outcomes Within 1-Year Follow-up	MS Cohort (N=18,734)	Non-MS Cohort (N=93,658)	Mean Excess Claims (95% CI)	OR/IRR (95% CI)
<b>Inpatient Admission, n (%)</b>	2791 (14.9)	6427 (6.9)	NA	2.38 (2.27-2.49)
# Inpatient Admissions, mean (SD)	0.26 (0.80)	0.11 (0.52)	0.15 (0.14-0.16)	<b>2.40 (2.26-2.54)</b>
<b>Outpatient Visit, n (%)</b>	18,723 (99.9)	93,600 (99.9)	NA	1.05 (0.55-2.01)
# Outpatient Visits, mean (SD)	36.1 (53.3)	22.8 (34.9)	13.4 (13.0-13.8)	<b>1.59 (1.56-1.62)</b>
<b>ED Visit, n (%)</b>	4652 (24.8)	19,496 (20.8)	NA	1.26 (1.21-1.30)
# ED Visits, mean (SD)	0.66 (3.28)	0.48 (1.52)	0.18 (0.16-0.19)	<b>1.36 (1.31-1.42)</b>
<b>ICU Admission, n (%)</b>	386 (2.1)	1047 (1.1)	NA	1.86 (1.65-2.09)
# ICU Admissions, mean (SD)	0.04 (0.35)	0.02 (0.20)	0.02 (0.018-0.022)	<b>2.10 (1.93-2.29)<sup>†</sup></b>
<b>Pharmacy Prescription, n (%)</b>	17,540 (93.6)	82,410 (88.0)	NA	2.00 (1.88-2.13)
# Pharmacy Prescriptions, mean (SD)	46.6 (46.6)	28.2 (33.3)	18.4 (17.8-19.0)	<b>1.65 (1.62-1.68)</b>

<sup>†</sup>Poisson model was used due to nonconvergence in negative binomial model. Note that the mortality rate at 1 year did not differ between patients with vs. without MS (0.10% vs. 0.09%). ED, emergency department; ICU, intensive care unit; IRR, incidence rate ratio; MS, multiple sclerosis; NA, not applicable; OR, odds ratio.

- The MS cohort exhibited significantly higher all-cause medical (\$17,606 vs \$8,612, cost ratio 2.04 [2.00-2.09]) and pharmacy (\$10,985 vs \$976, cost ratio 10.58 [10.3-10.87]) costs (**Figure 1**)

**Figure 1. One-Year Healthcare Costs Per Person**



Note: Pharmacy costs were the actual contracting rate. Medical costs were proxied by Medicare reimbursement estimates. An "average cost" method was developed by the VA Health Economics Resource Center to estimate costs for all VA encounters. Costs for inpatient and outpatient care were estimated based on stopcode or bedsections. For inpatient costs, the negative binomial model was used as it was a better fit compared to the gamma model. All other measures used the gamma distribution. Costs shown are average cost per person. MS, multiple sclerosis.

## LIMITATIONS

- The healthcare resource utilization patterns and costs of MS among the US VA population are likely underestimated as veterans can seek care outside of the VA system
- The study findings may not be generalizable to patients outside of the US VA population, patients with other types of health insurance, or patients in other countries

**Reference:** 1. Cummings TH, et al. Rising Prevalence of Multiple Sclerosis in the Veterans Affairs Population. Poster Presented at Academy of Managed Care Pharmacy Nexus Meeting (AMCP Nexus); October 16-19, 2023; Orlando, FL, USA.

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