Disease Modifying Treatment Use and Healthcare Resource Utilization among Patients with Multiple **Sclerosis in Sweden: A Nationwide Register-based Study**

INTRODUCTION

- Multiple sclerosis (MS) is a chronic, demyelinating, inflammatory neurodegenerative disorder of the central nervous system that affects 3 times as many women as men.¹
- Research has demonstrated that the use of disease-modifying therapies (DMTs) can reduce the frequency and severity of MS relapses.²
- Population-level real-world evidence on DMT use and healthcare resource utilization among patients with MS are limited

OBJECTIVES

To evaluate DMT use as well as all-cause and MS-related healthcare resource utilization among patients with MS in Sweden

METHODS

Data Source

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- Data were collected from four national registers provided by the National Board of Health and Welfare (NBHW) and Statistics Sweden (SCB) in Sweden.
- National Patient Register (NPR) includes diagnoses, procedures, hospitalizations, and outpatient specialist services
- Prescribed Drug Register (PDR) includes dispensed items, amount, date of filled prescription
- Cause of Death Register includes date and cause of death
- Longitudinal Integrated Database for Health Insurance and Labor Market Studies (LISA) which includes socioeconomic characteristics
- Registers from the NBHW and SCB were linked through the unique personal identity number.

Study Patients

- Patients with ≥ 1 diagnosis of MS (ICD-10 G35) from January 1, 2001 to December 30, 2017 were selected. • Index date: Date of first diagnosis of MS in the NPR
- Baseline: 12-month period prior to the index date
- Follow-up: time from index date to date of death, lost to follow up or the end of the study period
- Patients with index date coinciding with death date or censoring date were excluded.

Study Measures

- Post-index utilization of approved DMTs throughout the study period were examined.
- All-cause healthcare resource utilization was defined as use of services associated with any conditions incurred from inpatient admissions or outpatient specialist visits.
- Disease-related healthcare resource utilization was defined as use of services associated with MS-specific conditions incurred from inpatient admissions or outpatient specialist visits.

Statistical Analyses

- Means, standard deviation (SD), medians and interquartile ranges (IQR) were reported for continuous variables and frequency and percentage were reported for categorical variables.
- All data analyses were conducted using SAS 9.4 (SAS Institute, Cary NC), and R version 4.0.5.

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RESULTS

Demographic Characteristics

- A total of 26,219 patients with MS were identified in Sweden between 2001 and 2017 (Table 1).
- Mean (±SD) age at index date was 46.3 (±15.4) years; 68.9% were female, the median follow-up time was 9.79 (interquartile range: 4.80, 14.7) years and visual disturbances including blindness was the most commonly reported comorbidity (14.6%).

Table 1: Demographic characteristics of patients with MS in Sweden	
	N=26,219
Female, n (%)	18,076 (68.9)
Age, years, mean (SD), median (Q1-Q3)	46.3 (15.4), 46.0 (34.0–57.0)
Education	
Not completed compulsory education (<9 yrs)	2418 (9.2)
Completed compulsory education (9 yrs)	2823 (10.8)
Upper secondary (2-3 yrs)	11,690 (44.6)
College/university	8244 (31.4)
Research education	220 (0.8)
Missing	824 (3.1)
Income, mean (SD), median (Q1-Q3)	€30,907 (€38,934), €27,260 (€16,885–€38,699)
Follow-up, years, mean (SD), median (Q1-Q3)	9.49 (5.34), 9.79 (4.80–14.7)
Comorbidities at baseline, n (%)	
Demyelinating diseases of the central nervous system	2506 (9.6)
Disorders of optic nerve and visual pathways	1827 (7.0)
Visual disturbances and blindness	1206 (14.6)

Note: Income was adjusted to year 2018 based on Sweden's Labor Cost Index obtained from Eurostat.

• MS incidence was stable over time (~0.01%) while prevalence of MS patients increased from 0.05% in 2001 to 0.13% in 2017.

DMT Use

- About 44.5% (n=11,662) of patients used DMTs during the post-index period, and median initiation time from MS diagnosis to DMT use was 5.8 months (Q1-Q3: 0.95-41.5 months).
- Among 11,662 patients, 58.6% had used interferon beta-1a, 24.6% had used glatiramer acetate, and 21.1% had used interferon beta- 1b (Table 2).

Table 2: DT use after the index date over the follow-up

	N=26,219
Patients with one of DMT after the index date, n (%)	11,662 (44.5)
Time from index date to first DMT, mean (SD), median (Q1–Q3)	21.99 (28.54) <i>,</i> 5.84 (0.95–41.51)
Interferon beta-1a	6833 (58.6)
Glatiramer acetate	2868 (24.6)
Interferon beta-1b	2465 (21.1)
Dimethyl fumarate	2406 (20.6)
Fingolimod	1760 (15.0)
Peginterferon beta-1a	430 (3.7)
Teriflunomide	585 (5.0)
Natalizumab	98 (0.8)
Others*	0

*Others: Alemtuzumab, Cladribine, Ocrelizumab, Siponimod

Data are n (%) unless otherwise specified.

Healthcare Resource Utilization

• 35.4% of patients had ≥1 all-cause inpatient admission during the first-year post-diagnosis and 30.0% had ≥ 1 MS-related admission (n=7,871) (Figure 1); 15.3% (of n=7871) had MS-related inpatient care longer than 1 month (Figure 2).





About 96.6% of patients had ≥ 1 all-cause outpatient specialist visits; 90.3% had ≥1 MS-related specialist visits (n=23,677) and 8.4% had > 5 visits (Figure 3).



The percentage of patients with ≥ 1 all-cause inpatient admission remained consistent, while the percentage of patients with \geq 1 MS-related inpatient admission increased slightly at 5-year, 10-year, 15-year follow up (Figure 4).



Strengths and Limitations

- This study used national population-level registers over a long observation period, allowing for completeness and accuracy of the linkage, assessed the resource utilization among patients with MS.
- Results are generalizable to Sweden.
- Primary healthcare data are still not reported on a national level, and there is lack of information on primary care diagnosis and biologic agents administered by infusion.

*Presenting Autho

CONCLUSIONS

- Patients with MS incurred substantial use of inpatient and outpatient services following MS diagnosis and imposed considerable resource utilization to patients, employers, and the society in Sweden
- Less than 50% MS patients are initiated on approved DMTs in Sweden. While the median time to initiation following MS diagnosis was 5.8 months, there are a subset of patients in whom DMT use is delayed; future studies may investigate rationale and outcomes associated with such delays.
- Future studies are also warranted to evaluate the impact of different DMTs on outcomes such as health care resource use and associated costs.

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Disclosures

Qian Cai, Kavita Gandhi Lilla Di Scala, and Michele Cole are employees of Janssen Pharmaceuticals and may hold stock in Johnson & Johnson. Iffat Rahman is an employee of SDS Life Science

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