Assessing Presence of MS-Related Symptoms as a Proxy for Disease Severity in Multiple Sclerosis Using Administrative Claims Data

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[1]University of Arizona; Tucson, AZ, USA; [2]Better Health Worldwide, Inc., Newfoundland, NJ, USA; [3]Workpartners LLC, Cheyenne, WY, USA; [4]EMD Serono, Rockland, MA, USA

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Disclosures:

BH: Advisor/speakers bureau for Biogen, Genentech, Genzyme, EMD Serono, Novartis, Viela Bio, Alexion. **RAB**: Employee of Better Health Worldwide, Inc. Better Health Worldwide, Inc. received funding from EMD Serono to conduct the study. **IAB:** Employee of Workpartners, LLC. Workpartners, LLC received funding from EMD Serono to conduct the study. **NK:** Consultant for Workpartners, LLC. Workpartners, LLC received funding from EMD Serono to conduct the study. **ALP** and **CL:** Employees of EMD Serono, Rockland, MA, USA.

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CONCLUSIONS

Preliminary findings showed that comorbidities and direct medical/non-DMT costs increased with severity

This proxy measure assessing the presence of MS-related symptoms using diagnostic codes, medication codes, and healthcare procedural codes may be more patient-centered in discerning patient disease severity in administrative claims data; however, further validation of this proxy measure is needed

INTRODUCTION

- The identification of patients with MS with varying levels of overall disease status is important to help select patient populations most likely to benefit from interventions and to assess the value and effectiveness of treatments[1]
- A challenge with using claims data for research is that the data are collected for reimbursement purposes and lack clinically relevant variables such as disease severity
- Previously-developed algorithms for estimating disease severity in administrative claims were based on diagnostic codes[2] or costs[3,4]
- An algorithm assessing the presence of MS-related symptoms using diagnostic codes, medication codes, and healthcare procedural codes may be more patient-centered and more sensitive in discerning patient disease severity

OBJECTIVE

To assess MS-related symptoms as a proxy for disease severity using administrative claims data and examine comorbidities and direct medical costs across severity categories

METHODS

Study design

- An enhanced administrative claims-based algorithm utilizing diagnostic codes, medication codes, and healthcare procedural codes was developed to categorize patients with MS by disease severity
- Published literature informed a mapping exercise conducted with a clinical expert neurologist to develop a schematic capturing codes that indicate a high likelihood of having mild, moderate, or severe MS disease (mutually-exclusive stepwise categories)
- Four body systems were assessed in the algorithm: bladder/bowel, psychiatric, cognitive, and physical function
- Patients were categorized as mild, moderate, or severe based on a combination of post-index symptoms as shown in **Table 1**
- Patients with a 'severe' score in any body system were considered to have 'severe MS'
- Remaining patients with a 'moderate' score in any body system were assigned to the 'moderate MS' category, and all other patients were considered to have 'mild MS'

Data source

- The proxy measure was applied to US Workpartners' claims data (1/1/2010–12/31/2019)
- Workpartners* is a health benefits consultant for a number of large US employers with diverse salary, job type, employee age, sex, and geographic region demographics
- The Workpartners Research Reference Database currently includes approximately 2.9 million employees and insured spouses/partners/dependents

*Formerly known as Human Capital Management Services (HCMS). HCMS was acquired by Workpartners in 2017.

Table 1. MS symptoms classified by disease severity category

System	Potentially moderate	Potentially severe
	A patient with MS, no severe codes, and any of the following moderate codes	A patient with MS and indicators for ≥1 system categories below
Bladder/ bowel	Urinary incontinence diagnosis AND Rx for urinary incontinence	1) Overactive bladder and/or visit to a urologist 2) Urinary incontinence AND Rx for urinary incontinence AND visit to a urologist 3) Stool Incontinence
Psychiatric	[Depression OR Rx for antidepressants] OR [Anxiety OR Rx for antianxiety medications]	[Depression OR Rx for antidepressants] OR [Anxiety OR Rx for antianxiety medications] AND visit to a psychiatrist
Cognitive	Mild cognitive impairment	Dementia (non-Alzheimer's)
Physical function	1) Spasticity diagnosis AND (Botox admin codes) 2) (Dysesthesia/paresthesia/hyperesthesia) AND pain modulating medications or opioids 3) Evidence of cane/walker 4) Rx for Ampyra	1) Spasticity diagnosis AND Baclofen intrathecal 2) Evidence of a wheelchair 3) Evidence of a fall 4) (Dysesthesia/paresthesia/hyperesthesia) AND pain medications/opioids and/or visit to a pain specialist

Note: Pain including fibromyalgia, trigeminal neuralgia, other pain syndromes, numbness/tingling, fatigue, soft-tissue disorders, and optic neuritis were not included since these symptoms could be present across the three categories.

METHODS (continued)

Patient population

- Patient eligibility criteria were:
  - ≥3 MS-related (ICD-9-CM/ICD-10-CM: 340.xx/G35) inpatient, outpatient, or MS DMT claims within a 1-year period (latest claim with at least 12 months follow-up = index date);
  - continuous enrollment 6 months pre-/1-year post-index; and
  - age 18–64 at index date

Study outcomes

- Baseline demographic characteristics that were evaluated included age at index (continuous) and gender
- Direct costs that were evaluated during follow-up included inpatient hospitalizations, outpatient hospital or clinic visits, emergency room visits, outpatient visits, laboratory tests and procedures, pharmacy, and other costs

Study analyses

- Categorical and binary variables were summarized using frequencies and percentages. Continuous variables were summarized using means and standard errors
- Baseline demographic characteristics and CCI, follow-up comorbidities, and direct medical and pharmacy costs were compared across patient disease severity categories
- All costs were adjusted to 2019 US dollars using components of the Consumer Price Index from the US Bureau of Labor Statistics

RESULTS

Patient baseline demographic and clinical characteristics

- The 1041 eligible patients were classified as mild (n=358 [34.4%]), moderate (n=491 [47.2%]), or severe (n=192 [18.4%])
- Patient age increased with increasing disease severity category. Mean [SE] patient age was lower for mild (47.9 [0.5] years) vs. moderate (49.7 [0.4]; p=0.007) and vs. severe (50.7 [0.7]; p=0.001) patients (**Table 2**)
- There were no significant differences in gender across the disease severity categories
- Patients with MS in the mild disease severity category had lower mean [SE] baseline CCI scores (0.34 [0.04]) than patients in the moderate (0.55 [0.06]; p=0.0068) or severe (0.74 [0.10]; p<0.0001) disease severity categories (**Table 2**)

Table 2. Baseline demographic characteristics and CCI scores of patients with MS

	Mild (n=358)		Moderate (n=491)		Severe (n=192)	
	Mean/%	SE	Mean/%	SE	Mean/%	SE
Patients with MS						
Age (years)	**47.9*†**	0.51	**49.7***	0.41	**50.7†**	0.66
Gender (% female)	76.3	2.3	80.2	1.8	73.4	3.2
CCI score	**0.34*†**	0.04	**0.55***	0.06	**0.74†**	0.10

Bolded values indicate statistically significant differences between groups.
*p<0.05 mild vs. moderate; †p<0.05 mild vs. severe.

Comorbidities during follow-up

- Overall mean [SE] CCI scores during follow-up were lower for mild patients (0.40 [0.05]) compared to moderate (0.68 [0.06]; p=0.0008) and severe (1.12 [0.13]; p<0.0001) patients, and for moderate vs. severe patients (p=0.0005)
- The proportion of patients with gastrointestinal disease (mild/moderate/severe: 14.2% / 26.1% / 43.2%), arthritis (mild/moderate/severe: 5.9% / 9.8% / 15.1%), and hypertension/hyperlipidemia/diabetes (mild/moderate/severe: 27.7% / 38.5% / 49.5%) increased with severity (all p<0.05) (**Figure 1**)
- A greater proportion of patients with moderate/severe vs. mild disease had substance abuse disorder (mild/moderate/severe: 1.7% / 4.3% / 5.2%; both p<0.05), chronic pain syndrome (mild/moderate/severe: 1.7% / 4.5% / 5.2%; both p<0.05), and chronic lung disease (mild/moderate/severe: 4.5% / 12.4% / 13.5%; both p<0.001) (**Figure 1**)

Direct medical costs during follow-up

- Mean [SE] direct medical costs were lower for patients with mild disease severity ($9923 [$1421]) vs. moderate ($21,326 [$2248]; p<0.0001) and severe ($36,876 [$5058]; P<0.0001) patients. Patients with moderate disease severity had lower direct medical costs than patients with severe disease (p=0.0012) (**Figure 2**)
- Patients had higher non-DMT pharmacy costs with moderate ($34,912 [$1779]; p<0.0001) and severe ($31,856 [$2793]; p=0.0021) vs. mild ($29,130 [$2027]) disease (**Figure 2**)

Figure 1. Comorbidities during 1-year follow-up for patients with MS by disease severity category

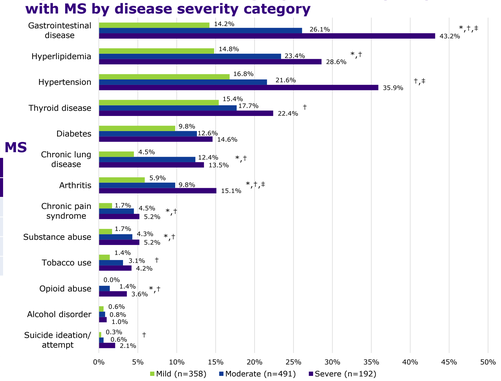

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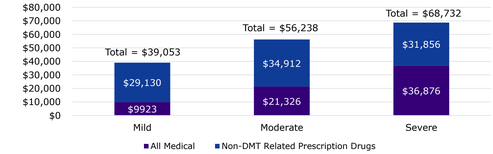
Figure 2. Direct costs during 1-year follow-up for patients with MS by disease severity category



Due to rounding, some totals may not correspond with the sum of the separate costs.

LIMITATIONS

- The ICD-9-CM and ICD-10-CM codes for MS do not distinguish between different types of MS, such as relapsing-remitting or primary progressive MS
- Potential limitations of administrative data include the risk of clerical inaccuracies, recording bias secondary to financial incentives, temporal changes in billing codes, and a lack of clinically relevant variables (e.g., MRI results)
- These administrative claims data are derived from employees with MS with commercial health insurance, and the data may not be generalizable to patients with MS who are not employed or to patients with MS who are employed but do not have health insurance from their employers
- The analysis was restricted to variables present in this database, and other factors that were not measured may have confounded the observed relationships

Abbreviations: CCI, Charlson Comorbidity Index; **DMT**, disease-modifying therapy; **MRI**, magnetic resonance imaging; **MS**, multiple sclerosis; **Rx**, prescription; **SE**, standard error

References: 1. Signori A, et al. Eur J Neurol. 2015;22(6):960-6; **2.** Berkovich R, et al. J Med Econ. 2021;24(1):46-53; **3.** Munsell M, et al. BMC Neurology. 2017;17(1):106; **4.** Nicholas J, et al. (P2.052). Neurology. 2017;88.

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SCAN FOR FULL AUTHOR DISCLOSURE DETAILS

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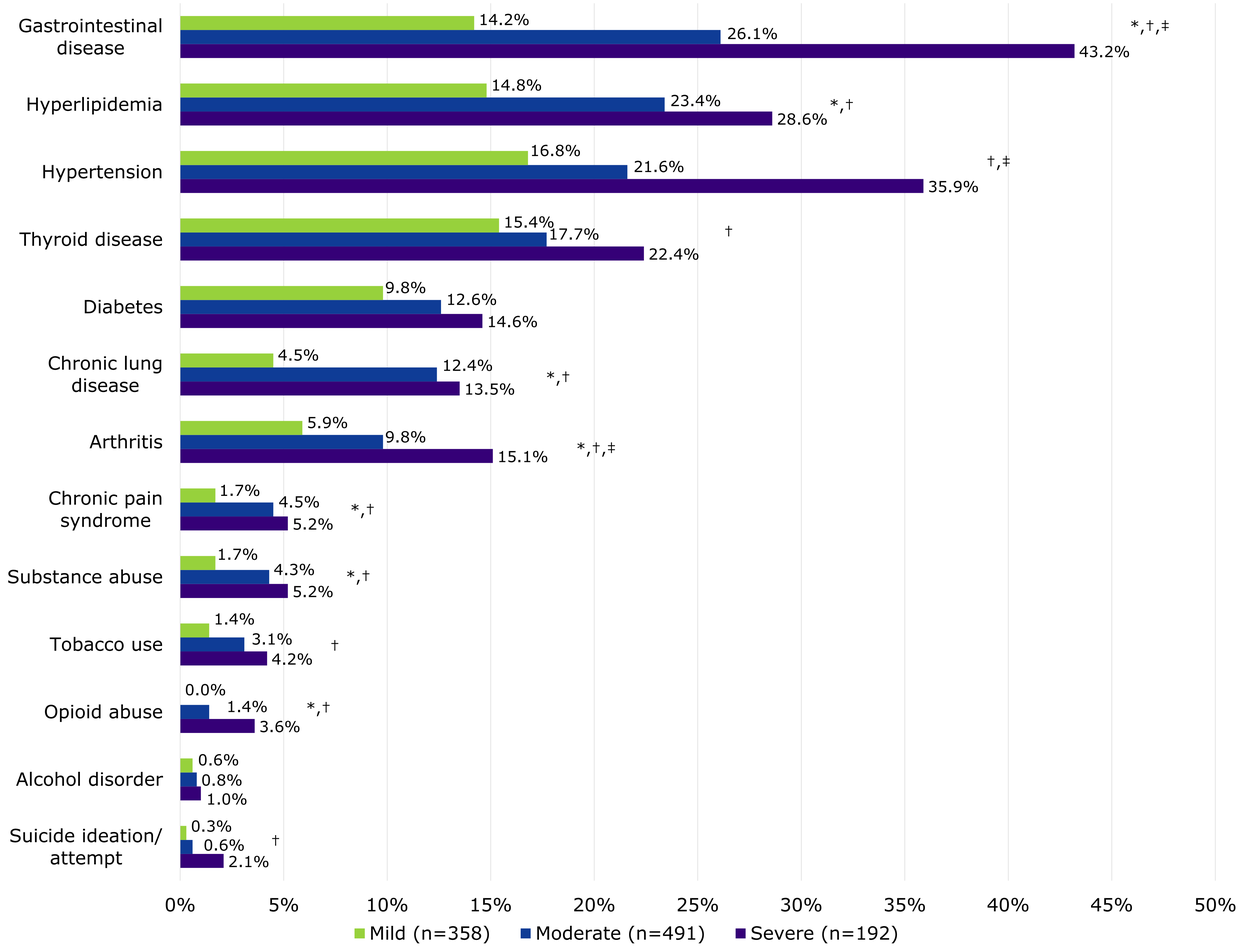

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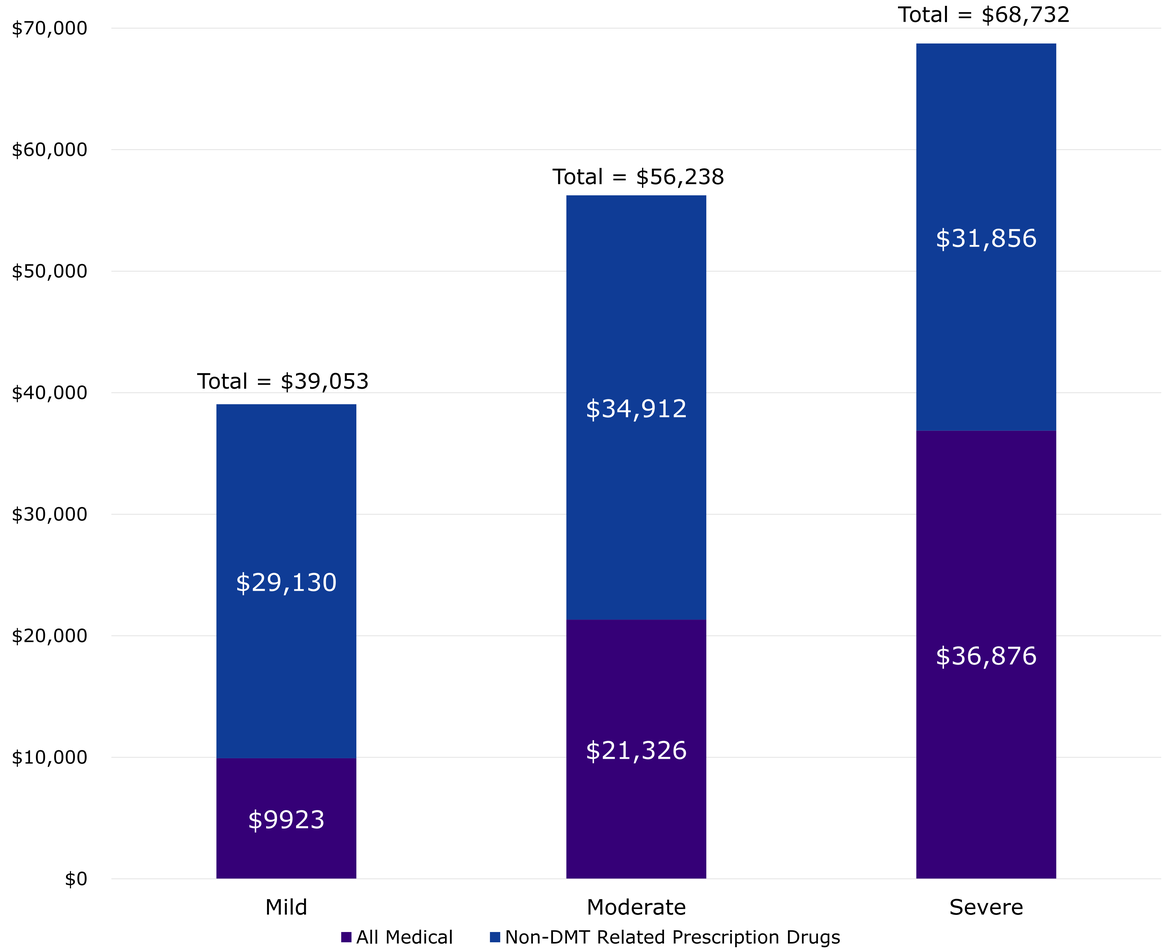
Figure 2. Direct costs during 1-year follow-up for patients with MS by disease severity category



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