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Comparison of Claims-Based Multiple Sclerosis Disease Severity Measures

in a Medicare Population

OBJECTIVES

Prior research has employed claims-based algorithms to measure multiple sclerosis (MS) disease severity. This study estimates the risk of traditional claims disease severity measures (relapses and hospitalizations) across MS disease severity levels.

METHODS

A sample of 6,559 patients was identified from Humana Medicare claims data from 1/1/2013-12/31/2015. Patients with MS, over the age of 18 with ≥2 years of continuous enrollment were included. A previously developed algorithm was used to categorize MS disease severity (low, moderate, high). Patients were divided into two groups based on Medicare eligibility, the age-eligible (over 65) and the disability-eligible (under 65) groups. Flexible parametric and cox proportional models were used to estimate the hazard ratios (HR) for relapse and MS-related hospitalization associated with disease severity and Medicare eligibility.

RESULTS

The disability-eligible group had higher risk for MS relapses (HR = 1.76, 95% CI 1.53-2.02) and hospitalizations (HR = 1.38, 95% CI 1.13-1.69) compared to those in the age-eligible group. The risk for MS relapses increased in the moderate (HR = 1.89, 95% CI 1.68-2.14) and high (HR = 3.69, 95% CI 3.09-4.41) disease severity groups compared to the low disease severity group. The same pattern was observed in MS-related hospitalizations, both the moderate (HR = 1.83, 95% CI 1.49-2.25) and high disease severity (HR = 6.42, 95% CI 5.07-8.13) groups had increased risk compared to the low disease severity reference group. When both eligibility and disease severity were considered simultaneously, the risk increased for both relapses and hospitalizations as disease severity increased. The eligibility types, however, did not appear to have a clear pattern across MS risk groups for either MS

CONCLUSION

Among MS patients, an algorithm-determined disease severity categorization appears consistent with relapses and hospitalizations, traditional claims-based measures of disease severity.

Variable	Overall	65 & Over	Under 65	P-Value
N	6559	2124	4435	
Age Years (mean (sd))	57.45 (10.58)	69.12 (5.28)	51.86 (7.48)	<0.001
Female (%)	5033 (76.7)	1693 (79.7)	3340 (75.3)	<0.001
Geographical Region (%)				<0.001
Midwest	1628 (24.8)	574 (27.0)	1054 (23.8)	
Northeast	238 (3.6)	88 (4.1)	150 (3.4)	
South	3911 (59.6)	1143 (53.8)	2768 (62.4)	
West	782 (11.9)	319 (15.0)	463 (10.4)	
No DMT Use (%)	3097 (47.2)	1363 (64.2)	1734 (39.1)	<0.001
DMT Oral (%)	889 (13.6)	136 (6.4)	753 (17.0)	<0.001
DMT Platform (%)	2192 (33.4)	595 (28.0)	1597 (36.0)	<0.001
DMT IV (%)	381 (5.8)	30 (1.4)	351 (7.9)	<0.001
MS Relapses (mean (sd))	0.27 (0.79)	0.16 (0.61)	0.31 (0.86)	<0.001
MS Hospitalization (mean (sd))	0.37 (2.23)	0.18 (1.63)	0.47 (2.46)	<0.001
Hospitalization (%)	459 (7.0)	96 (4.5)	363 (8.2)	<0.001
MS Relapse (%)	1125 (17.2)	247 (11.6)	878 (19.8)	<0.001
Eye Symptoms (%)	510 (7.8)	138 (6.5)	372 (8.4)	0.009
Brainstem Symptoms (%)	1008 (15.4)	327 (15.4)	681 (15.4)	0.995
Cerebellar Walking Symptoms (%)	1863 (28.4)	608 (28.6)	1255 (28.3)	0.806
Cerebellar Movement Symptoms (%)	1082 (16.5)	294 (13.8)	788 (17.8)	<0.001
Pyramidal Symptoms (%)	1223 (18.6)	308 (14.5)	915 (20.6)	<0.001
Sensory Symptoms (%)	876 (13.4)	211 (9.9)	665 (15.0)	<0.001
Bladder Symptoms (%)	1175 (17.9)	378 (17.8)	797 (18.0)	0.891
Cerebral Cognitive Symptoms (%)	698 (10.6)	246 (11.6)	452 (10.2)	0.096
Fatigue Malaise Symptoms (%)	2262 (34.5)	653 (30.7)	1609 (36.3)	<0.001
Depression Symptoms (%)	2778 (42.4)	741 (34.9)	2037 (45.9)	<0.001
Rehabilitation Use (%)	1215 (18.5)	422 (19.9)	793 (17.9)	<0.001
MPR (mean (sd))	80.89 (24.03)	84.58 (22.17)	79.86 (24.43)	0.057
MPR Adherence (%)	2274 (67.8)	557 (75.8)	1717 (65.6)	<0.001
Disease Severity Group				<0.001
Low	4468 (68.1)	1608 (75.7)	2860 (64.5)	
Moderate	1736 (26.5)	450 (21.2)	1286 (29.0)	
High	335 (5.3)	66 (3.1)	289 (6.5)	
DME = Durable Medical Equipment, DMT = Disease Modifying Therapy, MPR = Medication Possession Ratio				
*Chi squared or Independent T Test				

Eligibility	Hazard Ratio	95% CI
Reference Age Eligibility	1.0	
Disability Eligibility	1.38	1.125 - 1.693

Disease Severity	Hazard Ratio	95% CI
Reference - Low	1.0	
Moderate	1.83	1.491 - 2.247
High	6.422	5.071 - 8.133

Eligibility & Disease Severity	Hazard Ratio	95% CI
Reference Age Eligibility - Low	1.0	
Disability Eligibility - Low	1.131	0.855 - 1.495
Age Eligibility - Moderate	2.168	1.626 - 2.89
Disability Eligibility - Moderate	1.463	0.957 - 2.236
Age Eligibility - High	6.799	4.956 - 9.327
Disability Eligibility - High	7.681	4.687 - 12.588

Hazards Ratios and Confidence Intervals for MS-Related Hospitalization			
Variable	Hazard Ratio	P-Value	95% Confidence Interval
Eligibility Type Only			
Reference Age Eligibility			
Disability Eligibility	1.38	0.002	1.125 - 1.693
Disease Severity Only			
Reference Disease Severity - Low			
Disease Severity - Moderate	1.83	<0.001	1.491 - 2.247
Disease Severity - High	6.422	<0.001	5.071 - 8.133
Eligibility Type & Disease Severity			
Reference Age Eligibility - Disease Severity Low			
Disability Eligibility - Low	1.131	0.388	0.855 - 1.495
Age Eligibility - Moderate	2.168	<0.001	1.626 - 2.89
Disability Eligibility - Moderate	1.463	0.079	0.957 - 2.236
Age Eligibility - High	6.799	<0.001	4.956 - 9.327
Disability Eligibility - High	7.681	<0.001	4.687 - 12.588

Eligibility Type	Hazard Ratio	95% CI
Reference Age Eligibility	1.0	
Disability Eligibility	1.76	1.53 - 2.02

Disease Severity	Hazard Ratio	95% CI
Reference - Low	1.0	
Moderate	1.89	1.68 - 2.14
High	3.69	3.09 - 4.41

Eligibility & Disease Severity	Hazard Ratio	95% CI
Reference Age Eligibility - Low	1.0	
Disability Eligibility - Low	1.13	0.85 - 1.49
Age Eligibility - Moderate	2.17	1.63 - 2.89
Disability Eligibility - Moderate	1.46	0.96 - 2.24
Age Eligibility - High	6.80	4.96 - 9.33
Disability Eligibility - High	7.68	4.69 - 12.59

Hazards Ratios and Confidence Intervals for MS Relapse			
Variable	Hazard Ratio	P-Value	95% Confidence Interval
Eligibility Type Only			
Reference Age Eligibility			
Disability	1.758	<0.001	1.532 - 2.016
Disease Severity Only			
Reference Disease Severity - Low			
Disease Severity - Moderate	1.888	<0.001	1.714 - 2.074
Disease Severity - High	3.684	<0.001	3.127 - 4.303
Eligibility Type & Disease Severity			
Reference Age Eligibility - Disease Severity Low			
Disability Eligibility - Low	1.552	<0.001	1.412 - 1.702
Age Eligibility - Moderate	2.92	<0.001	2.626 - 3.235
Disability Eligibility - Moderate	1.553	0.002	1.217 - 1.946
Age Eligibility - High	5.012	<0.001	4.18 - 5.946
Disability Eligibility - High	4.802	<0.001	3.21 - 6.847

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