Baseline Disease-Modifying Therapy Use in the Multiple Sclerosis Continuous Quality Improvement Research Collaborative (MS-CQI)

Waters DD,[1] N'Dri LN,[1] Walsh K,[1] and Oliver BJ,[2,3] for the MS-CQI Investigators

[1] Jefferson College of Population Health, Philadelphia, PA; [2] Departments of Community & Family Medicine and Psychiatry, Dartmouth-Hitchcock Medical Center; [3] The Dartmouth Institute for Health Policy & Clinical Practice, Geisel School of Medicine at Dartmouth

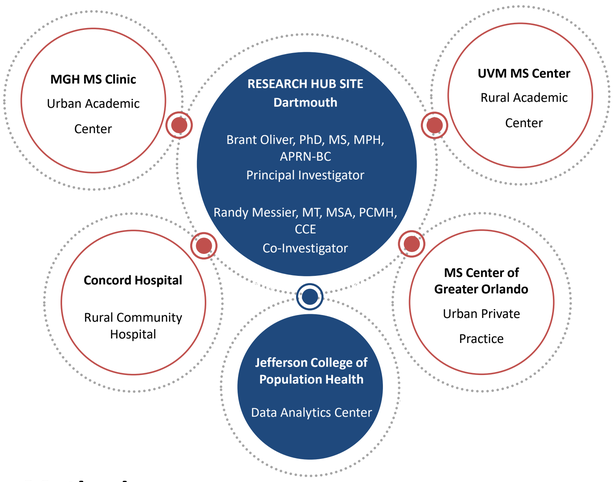
Background

- Systems-level improvement collaboratives can improve outcomes, quality, and value of care;[1,2] coproduction learning health system models[3] can empower quality improvement and research and demonstrate the value of multiple sclerosis (MS) care to payers and regulators
- MS-CQI is the first multi-center quality improvement research collaborative for MS care, with four participating MS centers (Figure 1)
- MS-CQI aims to conduct benchmarking analyses of geographic variation in MS care quality and study the effect of quality improvement interventions on selected performance indicators
- MS centers provide electronic health record (EHR) data and receive quarterly benchmarking reports on population health outcomes to inform improvement
- Disease-modifying therapy (DMT) use is an important care quality indicator, and is recommended for all relapsing forms of MS;[4,5] early DMT treatment can lower relapse rate and can potentially lower the risk of MS progression, brain atrophy, and disability accumulation[6-8]
- Little is known about systems-level variation in DMT utilization

Objective

- This study describes characteristics and DMT use among patients in the baseline year of MS-CQI

***Figure* 1. MS-CQI Infrastructure**



Methods

Study Design

- Cross-sectional study of baseline MS-CQI EHR data

Data Source

- EHR data collected via Redcap during the MS-CQI baseline year (7/1/2017 and 6/30/2018) from four participating MS centers: an urban academic center, a rural academic center, a rural community hospital, and an urban private practice

Study Population

- Inclusion: adults with a diagnosis of either relapsing-remitting MS (RRMS), primary progressive MS (PPMS), progressive-relapsing MS (PRMS), or secondary progressive MS (SPMS)
- Exclusion: missing or incorrectly input demographic or clinical information

Study Variables

- DMT use: oral (Aubagio, Extavia, Revia, Tecfidera, Zinbryta), infusion (Lemtrada, Novantrone, Ocrevus, Rituxan, Tysabri), injection (Avonex, Betaseron, Copaxone, Gilenya, Glatopa, Plegridy, Rebif, Vivitrol), no DMT
- Patient characteristics: demographic (age, sex), clinical (MS type, DMT type, relapse)

Statistical Analysis

- Chi-square tests were used to analyze differences in proportions of patients using various types of DMTs across centers and MS types.

Results

- A total of 2,679 MS patients were included in the study with a mean age of 51 years; 76.1% were on a DMT, 76.1% of patients were female, and 83.6% had RRMS (Table 1)
- 23.9% of patients in MS-CQI were not on any DMT; proportion of patients on no DMTs ranged from 15.2% to 37.0% across sites
- Of the 76.1% of patients on a DMT, 7.4% switched DMT types during the baseline period
- Proportion of patients on oral, infusion, and injection DMTs ranged from 20.5%-39.1%, 12.5%-31.1%, and 30.2-38.0% across sites, respectively; these proportions include patients who switched DMT types
- 2,352 patients had no switch in DMT type during baseline; 26.8% used an oral agent, 12.2% used an infusion, 33.3% used an injection, 27.2% were on no DMT (Figure 2)
- DMT use varied significantly by MS type, and was particularly low in PPMS and SPMS patients (Table 2)

Table 1. Baseline Patient Characteristics and DMT Use

	Center A (N=954)	Center B (N=395)	Center C (N=711)	Center D (N=619)	MS-CQI Total (N=2,679)	P-Value
Total Patients, %	35.6	14.7	26.5	23.1	100	
Age (mean, SD)	52.1 (11.9)	48.5 (13.1)	52.0 (12.8)	49.8 (12.5)	51.0 (12.5)	0.0505
Gender (n, %)						0.0214
Male	202 (21.2)	109 (27.6)	188 (26.4)	142 (22.9)	641 (23.9)	
Female	752 (78.8)	286 (72.4)	523 (73.6)	477 (77.1)	2,038 (76.1)	
Phenotype (n, %)						<.0001
PPMS	64 (6.7)	33 (8.4)	54 (7.6)	17 (2.7)	168 (6.3)	
PRMS	0 (0)	0 (0)	0 (0)	9 (1.5)	9 (0.3)	
RRMS	806 (84.5)	321 (81.3)	545 (76.7)	567 (91.6)	2,239 (83.6)	
SPMS	84 (8.8)	41 (10.4)	112 (15.8)	26 (4.2)	263 (9.8)	
Relapse (n, %)						<.0001
0	884 (92.7)	347 (87.9)	675 (94.9)	514 (83.0)	2,420 (90.3)	
1	61 (6.4)	46 (11.7)	33 (4.6)	97 (15.7)	237 (8.9)	
2+	9 (0.9)	2 (0.5)	3 (0.4)	8 (1.3)	22 (0.8)	
DMT type (n,%)						
No DMT	206 (21.6)	77 (19.5)	263 (37.0)	94 (15.2)	640 (23.9)	<.0001
Oral	373 (39.1)	118 (29.9)	146 (20.5)	187 (30.2)	824 (30.8)	<.0001
Infusion	119 (12.5)	74 (18.7)	96 (13.5)	193 (31.2)	482 (18.0)	<.0001
Injection	339 (35.5)	150 (38.0)	246 (34.6)	187 (30.2)	922 (34.4)	0.0549
Other DMT	1 (0.1)	2 (0.5)	5 (0.7)	2 (0.3)	10 (0.4)	0.2447
Oral/Infusion Switch	21 (2.2)	8 (2.0)	13 (1.8)	19 (3.1)	61 (2.3)	0.4704
Oral/Injection Switch	63 (6.6)	18 (4.6)	32 (4.5)	20 (3.2)	133 (5.0)	0.0200
Infusion/Injection Switch	0 (0)	0 (0)	0 (0)	5 (0.8)	5 (0.2)	0.0008

Note: patients who switched treatment type are counted twice within individual DMT type categories (oral, infusion, injection)

Figure 2. DMT Use among Patients with No Switch in Treatment Type over Baseline Period (N=2,352)

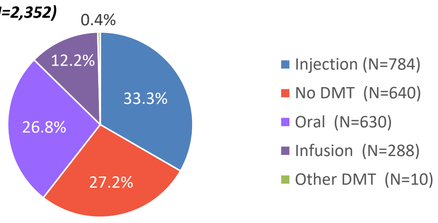


Table 2. DMT Use during Baseline Period across MS Types

	PPMS (N=168)	PRMS (N=9)	RRMS (N=2,239)	SPMS (N=263)	MS-CQI Total (N=2,679)	P-Value
DMT Use (n, %)						<.0001
Any DMT	93 (55.4)	9 (100.0)	1,781 (79.5)	156 (59.3)	2,039 (76.1)	
No DMT	75 (44.6)	0 (0.0)	458 (20.5)	107 (40.7)	640 (23.9)	

Discussion

- Significant variation in type of DMT use was observed across centers during the MS-CQI baseline period, suggesting that a systems-level focus is needed to further study and address variation to optimize outcomes
- The significant proportion of RRMS patients not using any type of DMT may be indicative of low care quality, and may be a target for quality improvement
- Examining the association between treatment switching and relapse may lead to a better understanding of the most effective treatment types for specific forms of MS and comorbidities
- The clinical characteristics of patient groups on various DMT types or not on DMTs may warrant further exploration to evaluate potential bias in future analyses
- As MS-CQI progresses, longitudinal research will be needed to estimate the effects of DMT use on outcomes of MS care, quantify the effects of duration and timing of exposure to DMT, and understand the impact of quality improvement interventions on systems-level population health outcomes

Limitations

- This cross-sectional descriptive study does not account for variation in timing of DMT exposure, and does not account for bias at the center- and patient-levels
- Centers have varying characteristics and are only located in Eastern US; patterns of care may not be representative of the broader US population
- This analysis did not capture the use of recently-approved DMTs, such as Mavenclad, Mayzent, and Ocrevus

Conclusion

- System-level variation in DMT use exists, suggesting a lack of standardization in DMT management
- Continued research and improvement efforts targeting system-level performance could influence DMT use and outcomes

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