The Role of Comorbidities in Comprehensive Healthcare Utilization Among Persons with Multiple Sclerosis

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Background

- Healthcare utilization is an indicator of health status. There are several factors that determine an individual's healthcare utilization, including the need and want to use healthcare services and then barriers to those services [1].
- Due to its chronic and symptomatic nature, multiple sclerosis (MS) has been shown to cause an increase in healthcare use [2]; however, persons with MS (PwMS) may also experience many barriers to accessing their healthcare due to MS symptoms or healthcare costs among other reasons [3].
- Comorbid conditions in multiple sclerosis (MS) are prevalent and have been associated with adverse health outcomes, including increased healthcare use in PwMS [4-14].
- Understanding the role of comorbidities in healthcare utilization including barriers to services among PwMS may help to determine if certain comorbidities may require greater attention in MS.

Objective

To determine the association between comorbidities and 1) healthcare utilization and 2) perceived barriers to care.

Methods

***Participants*:** Participants (n = 185) were recruited from the Mandell MS Center, a comprehensive MS Care Center located in a community hospital. Methods of recruitment included a study flyer or study email which contained an invitation to participate in the study with a link to a HIPAA-compliant electronic survey.

***Measures*:**

Demographics: age, gender, race/ethnicity, disease duration, height and weight (to calculate BMI), year of MS diagnosis, comorbid conditions, and MS subtype.

Patient Determined Disease Steps (PDDS): a self-report measure of disability ranging from 0 (normal) to 8 (bedridden) [15-18].

Healthcare Utilization: participants were asked how many times in the past 12 months they were admitted to a hospital, rehabilitation center, or nursing home, visited an emergency room or urgent care facility, visited specific specialists or physicians, and received services from rehabilitation services or imaging services.

Adapted version of the Barriers to Care Scale: participants were asked to rate the extent to which certain circumstances make it difficult to get care for MS on a scale of 1 (No problem at all) to 4 (Major problem) [19,20].

***Analyses*:**

- Descriptive statistics were run to characterize the sample.
- In order to evaluate differences between PwMS with and without a comorbidity, chi-square tests were used for categorical variables, median tests were used for ordinal variables, t-tests were used for normally distributed interval variables, and Mann Whitney U tests for non-normally distributed interval variables.
- If differences were found between PwMS with and without a comorbidity, regression models were conducted to determine which comorbidity had a role in the difference, controlling for age, gender, race, education, and annual income.
- While all comorbidities were reported, only those that were present in more than 5% of the current sample were examined in a bivariate analysis with the outcome variables (i.e., depression, anxiety, high blood pressure, high cholesterol, migraine, asthma, sleep apnea, autoimmune thyroid disease, diabetes, irritable bowel syndrome).

Results

Demographics:

Participants were mostly female and White with relapsing-remitting MS with a mean age of 48.2 ±11.9 years and disease duration of 12.0 ± 9.6 years. Approximately 75.7% of the sample reported a comorbidity, with the most prevalent being depression (35.7%), anxiety (29.2%), hypertension (27.0%), and hyperlipidemia (24.9%). Those who reported having a comorbidity were older (49.7±12.6 vs. 45.9±10.4, p=0.040) and had higher levels of physical disability (2.0 vs. 1.0, p=0.009).

Healthcare Utilization in the past 12 months, mean (SD)	Total Sample	No Comorbidity Reported	Comorbidity Reported	*p-value <0.05
Number of healthcare provider visits	25.5 (26.0)	18.5 (25.5)	27.8 (25.9)	**<0.001***
Total number of unique healthcare providers seen	7.1 (3.7)	5.0 (2.9)	7.8 (3.7)	**<0.001***
Number of urgent care visits [a]	0.4 (0.8)	0.3 (0.6)	0.5 (0.8)	0.264
Number of emergency room visits [a]	0.5 (1.7)	0.2 (0.6)	0.6 (1.9)	0.118
Number of inpatient hospital stays [b]	0.3 (0.9)	0.1 (0.4)	0.4 (1.0)	**0.036***
Number of inpatient hospital days [a]	1.1 (4.2)	0.8 (2.6)	1.23 (4.6)	0.085
Number of rehabilitation center stays [a]	0.1 (0.3)	0.0 (0.2)	0.1 (0.3)	0.819
Number of rehabilitation days [a]	0.5 (6.7)	0.3 (1.3)	1.3 (9.4)	0.830
Number of nursing home stays [c]	0.5 (6.7)	0.0 (0.0)	0.7 (7.7)	0.567
Number of nursing home days [c]	0.5 (6.7)	0.0 (0.0)	0.7 (7.7)	0.567
Number of elective surgeries [a]	0.1 (0.5)	0.0 (0.7)	0.2 (0.5)	**0.034***
Number of MRI images	1.5 (1.5)	1.0 (0.7)	1.6 (1.6)	**0.008***
Number of ultrasound images [e]	0.5 (0.8)	0.4 (0.7)	0.6 (0.8)	0.054
Number of PET scans [d]	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.805
Number of x-ray images [b]	0.7 (1.5)	0.3 (0.7)	0.6 (0.8)	**0.017***
Number of medications currently taken [e]	5.4 (6.1)	2.7 (2.1)	6.2 (6.7)	**<0.001***
Barriers to Care Scale, median (range)				
Long distances to medical facilities and personnel [a]	1.0 (no problem at all) (1-4)	1.0 (no problem at all) (1-3)	1.0 (no problem at all) (1-4)	0.787
Lack of transportation to access the services I need [a]	1.0 (no problem at all) (1-4)	1.0 (no problem at all) (1-3)	1.0 (no problem at all) (1-4)	0.798
Long wait-time for clinic appointments [c]	1.0 (no problem at all) (1-4)	1.0 (no problem at all) (1-3)	1.0 (no problem at all) (1-4)	0.340
Having too many medical appointments [e]	1.0 (no problem at all) (1-4)	1.0 (no problem at all) (1-3)	1.0 (no problem at all) (1-4)	0.127
School or work or other professional responsibilities [a]	1.0 (no problem at all) (1-4)	1.0 (no problem at all) (1-3)	1.0 (no problem at all) (1-4)	0.419
Caregiver or household responsibilities [c]	1.0 (no problem at all) (1-4)	1.0 (no problem at all) (1-3)	1.0 (no problem at all) (1-4)	0.497

[a] n=183, [b] n=184, [c] n=182, [d] n=179, [e] n=181

Table 1: Healthcare utilization and barriers to care bivariate analysis for PwMS with and without comorbidity.

Healthcare utilization:

After controlling for age, gender, race, educational attainment and annual income the following comorbid conditions were predictors of healthcare utilization:

- **Total unique providers seen:** sleep apnea (b=3.64, 95% CI: 1.89,5.39, p<0.001) and irritable bowel syndrome (b=2.60, 95% CI: 0.44, 4.76, p=0.018)
- **Number of medications taken:** depression (b=1.45, 95% CI: 0.33,2.57, p=0.012), diabetes (b=2.97, 95% CI: 0.79,5.14, p=0.008), high blood pressure (b=1.79, 95% CI: 0.52, 3.05, p=0.006), autoimmune thyroid disease (b=3.22, 95% CI: 1.48,4.96, p<0.001), and irritable bowel syndrome (b=2.93, 95% CI: 0.74, 5.12, p=0.009)
- **Number of inpatient hospital stays:** anxiety (b=1.00, 95% CI: 1.18, 6.52, p=0.027) and migraine (b=1.06, 95% CI: 1.11, 7.53, p=0.031)
- **Number of elective surgeries:** Anxiety (b=1.25, 95% CI: 1.22, 10.05, p=0.0202)
- **Number of x-rays:** sleep apnea (b=1.14, 95% CI: 1.04,9.35, p=0.043)
- None of the individual comorbidities were significant in the regression model for number of provider visits and number of MRIs.

Barriers to Care:

There were no significant differences between those with and without a comorbidity when looking at barriers to care.

Discussion

- PwMS with a comorbid condition in this sample had a general increase in healthcare services used in the prior 12 months, which is consistent with previous literature [4-14].
- Several comorbidities were found to have a role in increased healthcare utilization, including:
  - Sleep apnea
  - Irritable bowel syndrome
  - Diabetes
  - High blood pressure
  - Autoimmune thyroid disease
  - Anxiety
  - Migraine
- Three of these comorbidities (sleep apnea, anxiety and irritable bowel syndrome) were found to predict increased healthcare use more often than any of the other comorbidities.
  - These findings suggest that PwMS with comorbid sleep apnea, anxiety, and irritable bowel syndrome may require more attention in the management of their conditions.
- Data here also reinforces the need for early treatment and screening of comorbid conditions and patient education to possibly reduce the shear amount of healthcare use and therefore the cost burden for PwMS.

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Acknowledgements

The authors would like to thank Dotty Wakefield, MS, for management of the REDCap database and Frances Garay for her assistance with data collection.

The views and opinions expressed in this presentation reflect those of the authors and do not necessarily reflect those of the United States Department of Veterans Affairs.

This study was funded by a *BestCare* grant from St. Francis Hospital and Medical Center.