MEDICATION ADHERENCE WITH DISEASE MODIFYING TREATMENTS FOR MULTIPLE SCLEROSIS: FINDINGS FROM A U.S. NATIONAL DATABASE OF EMPLOYEES

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BACKGROUND:

- Multiple sclerosis (MS) is an acquired, inflammatory and immune mediated disorder of the central nervous system characterized by inflammation, demyelination and degeneration of axonal neurons. It affects about 2 million persons worldwide and from 350,000 to 450,000 in the United States.[1,2]
- Medication adherence in chronic diseases like multiple sclerosis plays an important role in predicting long term outcomes.
- Medication non-adherence in MS may be partially caused by injection anxiety.[3]
- Data on medication adherence with disease modifying treatments (DMTs) are available for the treatment of MS.
  - A study based on patients with relapsing remitting multiple sclerosis,[4] found MPR (the number of days with a medication supply divided by days in the time period) decreased with increasing co-payments and increased with increasing age.[4]
  - Another study found that the proportion of patients with secondary progressive MS that stopped DMT therapy was 30%, while only 13.5% of the patients with relapsing remitting MS stopped therapy ($P < 0.0001$).[5] Expanded Disability Status Scale (EDSS) score at entry was the main factor that predicted interruption of therapy.[5]
  - Unfortunately, adherence comparisons between employees on different DMTs are not available.

OBJECTIVE:

- The Study Objective was to compare adherence among employees treated with DMTs for MS.

METHODS:

- A retrospective analysis was performed using patient claims data (1/1/2001 to 6/30/2008) from the Human Capital Management Services (HCMS) Research Reference Database consisting of approximately 670,000 employees and representative of the US Employed Civilian Labor Force in 2004.
- Employer insurance claims records were analyzed for medical costs and health service utilization.
- Anonymity of person-level data was maintained according to the Health Insurance Portability and Accountability Act guidelines.
- Healthcare was provided through managed care plans contracted by respective employers.
- International Classification of Diseases-9th Revision (ICD-9) codes were used to identify subjects with MS (ICD-9 code of 340.XX).
- Patients were included if they had two or more DMT prescriptions or 1 DMT prescription with a MS diagnosis [ICD-9=340.XX]). DMTs included:
  - Interferons (IFN):
    - Intramuscular (IM) IFNb-1a (Avonex®);
    - IFNb-1b (Betaseron®);
    - Subcutaneous (SC) IFNb-1a (Rebif®)
  - Glatiramer acetate (Copaxone®)
- Employees continuously employed and with health plan coverage for one year following DMT initialization were eligible.
- Three measures were used in estimating adherence after DMT initialization:
  - Annual persistence, defined as the sum of days with a medication supply prior to any 30-day gap in supply.
  - Annual compliance defined as Medication Possession Ratio (MPR).
  - Distribution of medication supply, defined as the percent of each study cohort with a supply of medication in each number of months (1-12).

Statistical Analysis:

- Comparisons between DMT groups were made using:
  - Wilcoxon tests on Kaplan Meier survival data to compare persistence
  - *T*-tests to compare MPR
  - Chi-square tests to compare the distributions of medication supply by number of months
- Differences were considered significant at $P < 0.05$.

TABLE 1: Demographics

Variable	Employees with Avonex Treatment (N=179) Mean (S.E.) or %	Employees with Betaseron Treatment (N=63) Mean (S.E.) or %	Employees with Copaxone Treatment (N=96) Mean (S.E.) or %	Employees with Rebif Treatment (N=20) Mean (S.E.) or %
Age (at index date[1])	41.52 (0.06)	40.75 (1.02)	39.60 (0.86)	37.88 (1.59)
Tenure (at index date[1])	9.79 (0.58)	8.32 (0.93)	6.65 (0.68)	6.08 (1.38)
Annual Salary	$64,324 ($3,201)	$55,660 ($3,410)	$61,738 ($3,445)‡	$65,799 ($8,498)†
Female	64.2%	63.5%	61.5%	70.0%
Married	46.9%	55.6%	50.0%	45.0%
Not Married	41.3%	25.4%	28.1%†	15.0%†
Missing Marital Status	11.7%	19.0%	21.9%†	40.0%‡
White	53.1%	52.4%	55.2%	60.0%
Black	10.6%	11.1%	5.2%	0.0%
Hispanic	3.4%	6.3%	4.2%	10.0%
Other	1.7%	1.6%	2.1%	0.0%
Race Missing	31.3%	28.6%	33.3%	30.0%
Exempt	46.4%	42.9%	46.9%	55.0%
Full Time	96.1%	98.4%	96.9%	90.0%
Charlson Comorbidity Index	0.106 (0.035)	0.286 (0.129)	0.094 (0.033)	0.300 (0.179)

†P <0.01 vs. Avonex; ‡P <0.05 vs. Avonex

TABLE 2: Medication Possession Ratio by DMT

Variable	Employees with Avonex Treatment	Employees with Betaseron Treatment	Employees with Copaxone Treatment	Employees with Rebif Treatment
N	**179**	**63**	**96**	**20**
MPR	0.782†	0.705	0.698†	0.761
S.E.	0.021	0.036	0.028	0.049

†P=0.0160 Avonex vs Copaxone

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RESULTS:

- Overall, 358 employees were eligible for analysis (**Table 1**).
  - No significant differences in age, gender, and certain job-related variables existed between cohorts.
- Overall adherence:
  - Persistence (**Figure 1**) was:
    - Significantly better for Avonex than Betaseron (P=0.0096) and Copaxone (P=0.0004) and
    - Non-significantly better than Rebif (P=0.1207).
    - Greater at 1-year for Avonex employees (60.89%) than employees using:
      - Betaseron (42.86%, P=0.0131),
      - Copaxone (42.71%, P=0.0039), and
      - Rebif (45.00%, P=0.1700).
  - Adherence, based on the MPR (**Table 2**), was:
    - Highest for Avonex (MPR=0.782) and was:
      - Significantly higher than Copaxone (MPR=0.698, P=0.0160) and
      - Non-significantly higher than Betaseron (MPR=0.705, P=0.0576) and Rebif (MPR=0.761, P=0.7347).
  - Distribution of Medication Supply (**Figure 2**)
    - The Avonex cohort was most likely to have the highest month's supply with almost 50% having a full year (12 months) of therapy

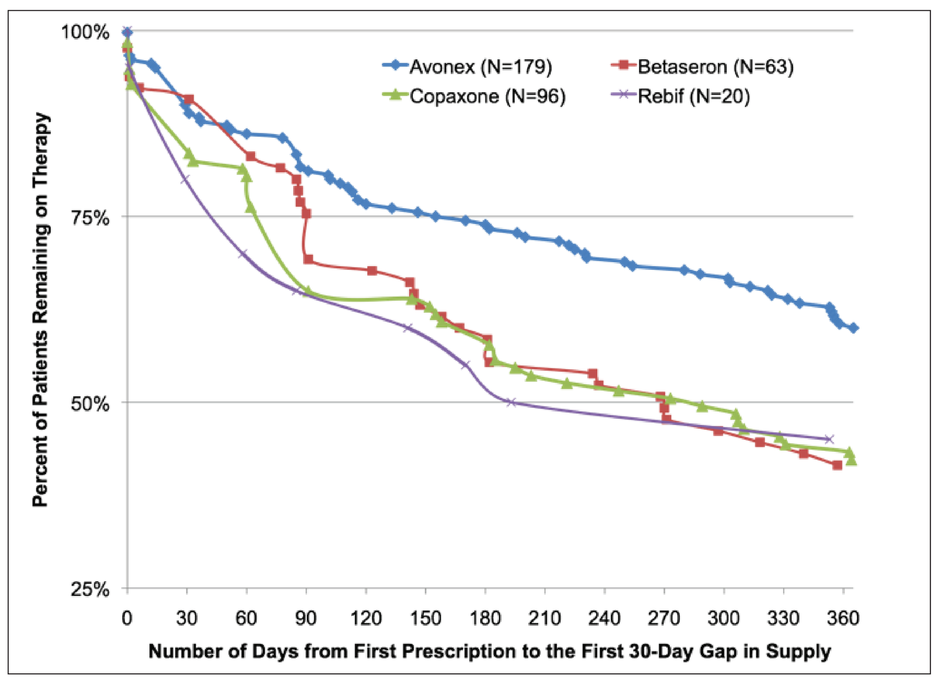
LIMITATIONS:

- While this study adds to the body of evidence about persistence and adherence among employees with MS treated with DMTs, the study has the same limitations characteristic of database studies using administrative claims, i.e., lack of severity classification, MS stage or type, and may not be representative of MS patients who are not diagnosed, who are not treated, who are treated with other therapies, or not able to maintain employment. Furthermore, the small sample size suggests that results may be interpreted with caution. Despite such limitations, the study cohorts had no significant differences in age, gender, and certain job-related variables, and thus, the study represents an important addition to the literature.

CONCLUSIONS/RELEVANCE:

- Among employees treated with Avonex, Betaseron, Copaxone or Rebif for MS, Avonex patients had significantly greater medication adherence on all measures.
- Future research should determine the impact of increased persistence and adherence on patient outcomes, work-related absences, and health-related costs.

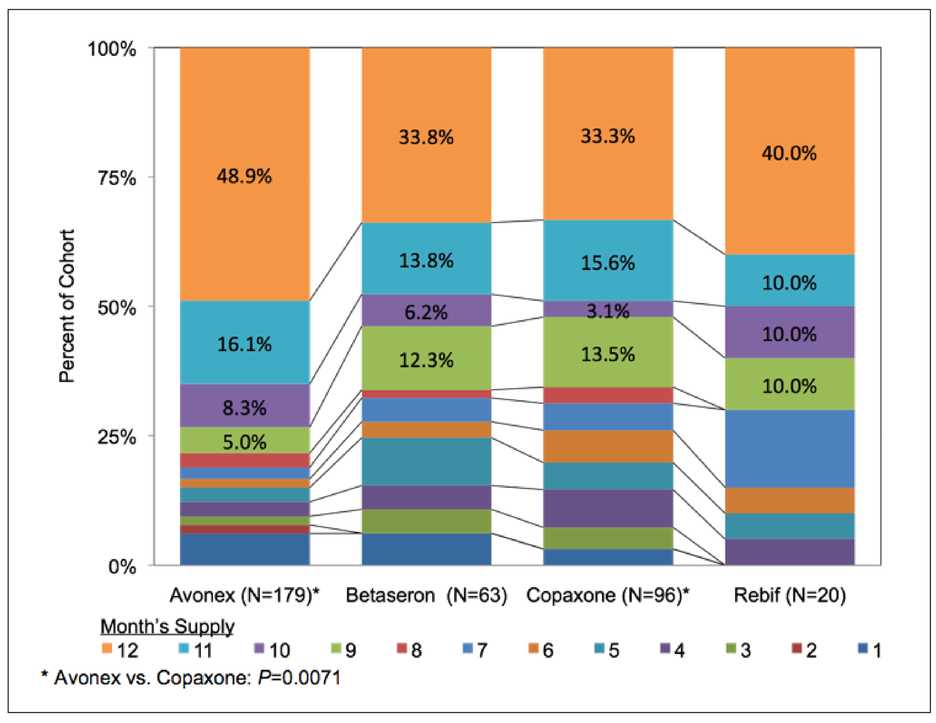
FIGURE 1: Kaplan Meier Curves of Medication Persistence



P-VALUES BETWEEN COHORTS

Avonex vs. Betaseron	Avonex vs. Copaxone	Avonex vs. Rebif	Betaseron vs. Copaxone	Betaseron vs. Rebif	Copaxone vs. Rebif
0.0096	0.0004	0.1207	0.4507	0.7968	0.4002

FIGURE 2: Percent of Study Cohorts with a Supply of Medication in Each Month



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