Linking Administrative Datasets from Alberta, Canada to Examine the Impact of Treatment Adherence on Healthcare Resource Utilization among MS Patients

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INTRODUCTION

- Alberta, Canada has one of the highest rates of multiple sclerosis (MS) in world (1:400).[1]
- Treatment adherence is critical in achieving efficacy and cost-effectiveness[2,] and adherence to medication may be the best possible strategy for managing MS.[3]
- The objective of this study was to retrospectively examine administrative data from Alberta Health and Alberta Health Services to understand the impact of adherence to disease-modifying therapies (DMTs) on healthcare resource utilization (HRU) among MS patients.

METHODS

Study design and patient population

- This retrospective study used the following datasets: Health Registry (demographic and geographic information), Discharge abstract database (inpatient), National Ambulatory Care Reporting System (ambulatory care), Practitioner Claims (fee-for-service claims), Pharmaceutical Information Network and Alberta Blue Cross datasets (prescription).
- Patients included those who met the Case Definition of ≥1 hospital separation OR ≥5 physician office person-day visits (multiple claims on the same day were counted once) based on ICD-9/10 codes 340/G35 for MS in a two-year period.
- The Study Index Date was the first dispense/claim for a DMT during the study period (April 1, 2011 to March 31, 2014). The follow-up period was 365 days after the index date.

Study Variables & Outcomes

- Patient and clinical characteristics included age, gender, geographic zone, index year, index DMT mode of administration, Charlson comorbidity index (CCI)[4] and comorbidities.
- Adherence was assessed using Medication Possession Ratio (MPR) in the follow-up period. Those with an estimated MPR ≥80% were considered adherent.
- Secondary outcomes included treatment discontinuation (a ≥60 or 90 day gap in drug claims prior to resuming therapy during the follow-up period), switching and patterns. HRU included ambulatory care visits, physician claims (GP, specialists) and hospitalizations. MS-related HRU was determined using ICD9/10 codes for MS-related services.

Statistical Analysis

- Study variables and outcomes were summarized using descriptive statistics. Frequencies and percentages were calculated according to the number of patients for whom data was available. Data are presented as mean ± standard deviation (SD) for normally distributed numeric variables and as median (range) for abnormally distributed variables. Chi-Square test was used to compare differences between groups.
- The impact of adherence (MPR ≥80%) on HRU was explored using multivariable negative binomial and logistic regression models. The incidence relative risk (IRR) with 95% CI and odds ratio (OR) with 95% CI were estimated in these models, respectively. The mean of HRU also estimated in the model while adjusting for others factors. The significance level α=0.05 was used to determine statistical significance.
- Data analyses were performed using SAS version 9.4 (SAS institute, Cary NC).

RESULTS

Patient Population

- A total of 2864 MS patients were identified with a DMT claim between April 1, 2011 and March 31, 2014. The majority of patients were between the ages of 35 and 55, female and the most common comorbidities included depression, anxiety, and hypertension (**Table 1**).

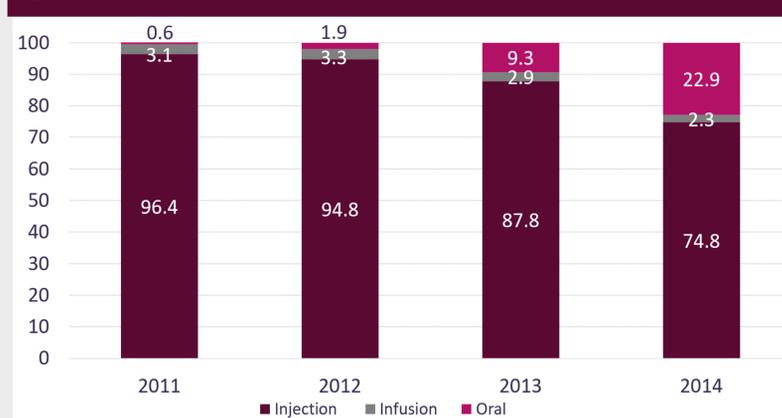Table 1. Baseline Demographic and Clinical Characteristics

Characteristic	N (%)
Age	
<35	716 (25.0)
35-55	1768 (61.7)
55-65	338 (11.8)
≥65	42 (1.5)
Gender	
Male	750 (26.2)
Female	2114 (73.8)
Mode of Administration	
Injection	2709 (94.6)
Infusion	83 (2.9)
Oral	72 (2.5)
Most Common Comorbidities (>10%)	
Depression	885 (30.9)
Anxiety	515 (18.0)
Hypertension	292 (10.2)

[1]Other comorbidities examined were chronic lung disease (4.7%), Hyperlipidemia (4.3%), bipolar disorder (4.3%), diabetes (3.1%), cardiovascular disease (2.8%), ischemic stroke (1.7%), epilepsy (1.3%) and ischemic heart disease (1.3%).

Health Resource Utilization

- Adherent patients had a lower mean number of ambulatory care visits and physician claims, and a lower proportion of hospitalizations than non-adherent patients (**Table 2**).

Table 2. Healthcare Resource Utilization in Adherent and Non-Adherent Patients (MPR)
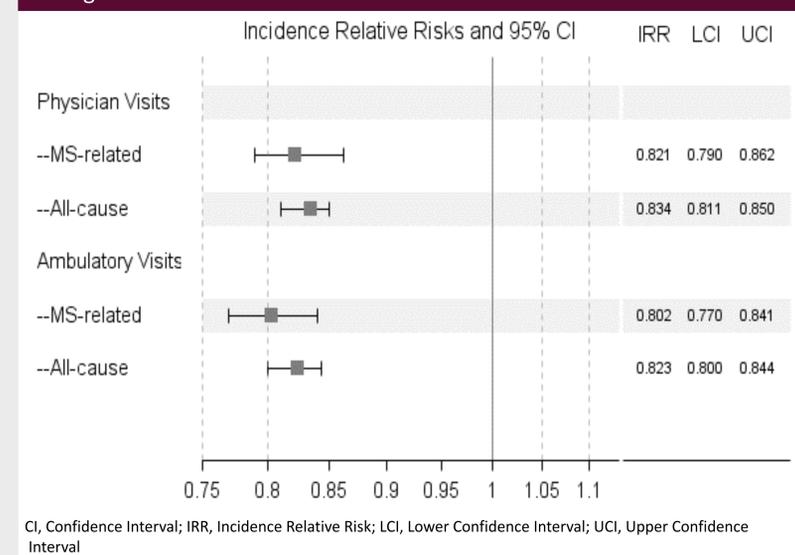
Characteristic	Adherent	Non-Adherent	P-Value
Number of Ambulatory Care Visits[1], mean(SD)			
All Cause	8.8±10.2	10.9±14.9	0.0012
MS-Related[2]	4.3±5.0	5.3±6.3	0.001
Number of Physician Claims[3]			
All Cause GP Visit	7.8±9.9	9.5±12.8	0.0002
MS-Related GP Visit[2]	3.1±7.8	3.9±9.5	0.0336
All Cause Specialist Visit	7.8±9.8	9.5±14.0	0.0036
MS-Related Visit [2]	2.2±2.4	2.5±2.5	0.0001
Number of Hospitalizations[4], n (%)			
MS-Related[2], n (%)	23 (1.2)	25 (2.5)	0.0088
All Cause, n (%)	97 (5.2)	100 (10.2)	<0.0001

[1]Ambulatory care visits are based on facility based ambulatory care information, including same-day surgery, day procedures, emergency department visits, and community rehabilitation program services which occur in publicly-funded facilities; [2]An MS case was defined by using ICD-9/10 codes 340/G35 for MS in the primary and secondary diagnostic codes in the Inpatient dataset and Ambulatory Care datasets and in the primary diagnostic code for Practitioner Claims.; [34]Physician claims are based on Fee for Service claims for physicians and other providers (e.g. specialists); [4]Hospitalizations refer to inpatient hospital admissions;

Multivariate Models

- Adherent patients had approximately 20% less physician and ambulatory care visits, as well as approximately 50% fewer hospitalizations than non-adherent patients, after adjusting for age group, gender, mode of administration, and CCI (**Figure 2**).

Figure 2. Adjusted IRR and 95% CI (Adherent vs Non-Adherent) for HRU among MS Patients

	IRR	LCI	UCI
Physician Visits			
--MS-related	0.821	0.790	0.862
--All-cause	0.834	0.811	0.850
Ambulatory Visits			
--MS-related	0.802	0.770	0.841
--All-cause	0.823	0.800	0.844

CI, Confidence Interval; IRR, Incidence Relative Risk; LCI, Lower Confidence Interval; UCI, Upper Confidence Interval

Treatment Adherence, Discontinuation & Patterns

- 65.7% of the patients were adherent during the follow-up period.
- The rate of discontinuation was significantly different between adherent and non-adherent patients (p<0.0001 for >60 and >90 day gap) prior to resuming treatment.
- Patients taking an oral DMT remained on an oral DMT
- The proportion of patients taking oral DMTS increased from 0.6% in 2011 to 22.9% in 2014 (**Figure 1**).

Figure 1. Treatment Patterns across the Study Period (2011-2014)

CONCLUSIONS

➢ A total of 2864 patients were identified with a DMT claim during the study period.

➢ The majority of patients were between the ages of 35 – 55, female and the most common comorbidities included depression, anxiety, and hypertension.

➢ 65.7% of patients were adherent to their DMT in the follow up period.

➢ The rate of treatment discontinuation (>60 days and >90 days) was significantly lower among adherent patients than non-adherent patients.

➢ All patients taking an oral DMT remained on an oral DMT, and the proportion of patients taking oral medications increased across the study period.

➢ Adherent patients had approximately 20% fewer physician claims, 20% fewer ambulatory care visits, and approximately 50% fewer hospitalizations.

➢ These findings are aligned with the existing literature5-7 demonstrating that adherent MS patients have reduced healthcare resource utilization.

➢ The importance of treatment adherence on clinical and economic outcomes should inform patient, provider, and health system decision-making for MS.

References: (1) Alberta Health. The Way Forward: Alberta's Multiple Sclerosis Partnership. Edmonton, 2013. (2) World Health Organization. Adherence to Long-Term Therapies: Evidence for action., 2013. (3) He D, Xu Z, Dong S et al. Cochrane Database of Systematic Reviews 2012. (4) Quan H, Sundararajan V, Halfon P et al. Medical care 2005;43:1130-9. (5) Raimundo K, et al. BMC health services research 2013;13:131. (6) Steinberg SC, et al. Clinical drug investigation 2010;30:89-100. (7) Yermakov S, et al. Journal of medical economics 2015;18:711-20.