



Multiple sclerosis disease modifying therapies' adherence and total medical or disease associated costs or inpatient events using Pharmacy Quality Alliance guidelines and MarketScan Commercial Claims and Encounters database

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Multiple sclerosis disease modifying therapies' adherence can lead to lower medical costs (combined inpatient and outpatient) and fewer rates of hospitalization and shorter days stay.

OBJECTIVES

- To identify significant associations between Pharmacy Quality Alliance(PQA) disease-modifying therapies (DMT) medication adherence with total medical (i.e., inpatient and outpatient) cost, or multiple sclerosis (MS) associated medical costs, or hospitalizations and length of stay, as well as pharmacy costs over a 2-year period.

METHODS

- We used a retrospective cohort design with commercially-insured patients from the MarketScan Commercial Claims and Encounters database from 2015--2017.
- DMT adherence was calculated with PQA criteria: age (≥ 18 years), continuous enrollment, 365 day follow-up from index date for proportion of days covered (PDC), and non-infused DMT list (i.e., *interferon beta 1a*, *interferon beta 1b*, *peginterferon beta-1a*, *glatiramer*, *fingolimod*, *teriflunomide*, and *dimethyl fumarate*).
- Selected patients had at least two DMT fills (56 plus day supply) starting 1/1/2015 (with 2nd year follow-up starting up to Dec 2017 from index), and no indications of death or hospice stay.
- MS diagnosed patients were categorized as (a) consistently adherent (PDC $\geq 80\%$) in both years, (b) adherent only in one year, or (c) adherent in neither year.
- Outcomes were a combined 2-year total medical costs, MS associated medical costs (ICD coding), count of hospital admissions, bed days for those hospitalized, DMT pharmacy costs, and associated medication pharmacy costs.
- General Linear and Logistic models' covariates included gender (female vs. male), age (log transform), census region (southern vs. other), metropolitan location (metro vs. not metro), count of associated MS medication therapy groups (0-9), DMT switching (more than single ingredient over 2 years), DMT mail order (all vs. mix or other), presence of comorbidity (any Charlson comorbidity index category), and changed insurance type (category changes over 2 years). In addition, an interaction term between comorbidity and adherence cohorts was included, and necessary for the described adherence effects on costs.

RESULTS

- A total of 18,507 MS patients met criteria for the study for either pharmacy or total costs and 18,127 for MS associated medical costs. For the respective study samples, 60.6% or 61.5% were adherent in both years, 26.5% or 25.8% were adherent in 1 of 2 years, and 12.9% or 12.7% of patients were non-adherent in both years. To note, adherence was significantly lower in the second year compared to the first year, with PDC decreasing significantly by 7.3% ($p < .0001$) in the second year and percent adherent drops from 80.6% to 67.0% ($p < .0001$).
- General linear models for pharmacy costs with covariate coding described in methods indicated that adjusted costs for DMT pharmacy were significantly higher for those consistently adherent vs never adherent ($p < .0001$; see Table 1: a mean difference of \$55,757). Other significant covariates were lower costs for older patients ($p < .02$) and females ($p < .0001$), but higher costs for southern region ($p < .0001$), DMT change ($p < .0008$), mail order ($p < .0001$), and number of associated therapy classes ($p < .0001$).

Table 1: Costs Outcomes Adjusted Means and Standard Errors (s.e.) for Cohort Effect.

Modeled Outcomes	Non-adherent		Mixed Adherence		Adherent		Cohort Effect
	mean	s.e.	mean	s.e.	mean	s.e.	p value
2 year sum							
DMT cost	\$84,936*	\$720	\$110,258*	\$605	\$140,693*	\$527	<.0001
Associated Rx cost	\$12,991*	\$1,773	\$21,698*	\$1,489	\$27,837*	\$1,298	<.0001
Medical cost	\$13,547	\$690	\$13,892*	\$580	\$12,605*	\$505	<.0001
MS Medical cost	\$1,785	\$177	\$1,870*	\$149	\$1,447*	\$130	<.001

*Asterisk indicates those estimated means that are significantly different from each other across cohort levels

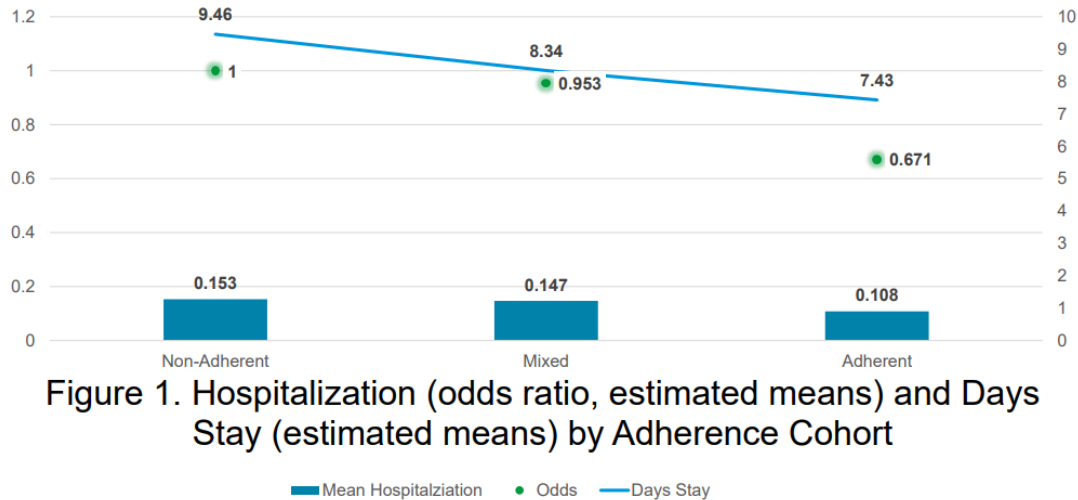


Figure 1. Hospitalization (odds ratio, estimated means) and Days Stay (estimated means) by Adherence Cohort

- A similar significant difference is present for the associated therapy prescriptions costs (e.g., CNS agents, muscle relaxers, antidepressants, etc.) between the adherent cohort vs never adherent cohort ($p < .0001$; see Table 1. a mean difference of \$14,846). Other significant covariates were lower costs for older patients ($p < .0001$), females ($p < .0004$), DTM change ($p < .03$), and comorbidity ($p < .002$) but higher costs for southern region ($p < .03$), metropolitan areas ($p < .02$), insurance change ($p < .02$), mail order ($p < .0001$), and number of associated therapy classes ($p < .0001$).
- Consistently adherent patients had significantly lower total medical costs (-\$1,287, $p < .02$), and significantly lower MS associated costs (-\$423, $p < .001$). In addition, this adherence impact interacted with presence of comorbidity in that a lower cost difference was greater among those with at least one comorbid condition (total -\$2,667, $p < .04$; MS costs -\$848, $p < .003$).
- Additional significant covariates for total medical costs included increased costs for older patients ($p < .02$), number of associated therapy classes ($p < .0001$), comorbidity ($p < .0001$), and DMT change ($p < .0001$), but lower costs for females ($p < .02$), and the southern region ($p < .0001$).
- For the MS associated model covariates, increased costs were present among those with a DMT change ($p < .02$), with a comorbidity ($p < .0001$), and higher number of associated therapy classes ($p < .0001$), but lower costs for females ($p < .03$), and the southern region ($p < .04$).
- In addition to the costs outcomes, hospitalization was examined as a binary event, as well as length of stay if hospitalized as days hospitalized, over the two year follow-up period.
- Logistic regression analysis established significantly fewer admissions for the adherent cohort compared to the non-adherent cohort (odd ratio of 0.67, $p < .0001$) (See Figure 1. bars for adjusted means or odds ratios). Other covariates indicated significantly higher odds for older patients ($p < .02$), change in insurance ($p < .03$), DMT change ($p < .0001$), increased number of associated therapy classes ($p < .0001$), and a comorbidity ($p < .0001$), but lower odds for females ($p < .02$), and southern region ($p < .04$).
- Interaction term between comorbidity and adherence cohort was not significant for hospitalization or length of stay.
- For hospitalized patients ($n=1,737$), the model indicated a trend towards shorter days with increasing adherence (see Figure 1 blue line), with significantly fewer bed days for the adherent cohort compared to the non-adherent

cohort (about 2 fewer days, $p < .03$). Significant covariates indicated a longer stay with comorbidities ($p < .0001$) as well as those with more associated therapy classes ($p < .0001$).

CONCLUSIONS

- DMT medication adherence (PDC $\geq 80\%$) can lead to lower medical costs (combined inpatient and outpatient) over a two year period, compared to non-adherent cohorts, with a greater cost difference for those with at least one comorbidity.
- There are significantly fewer rates of hospitalization and shorter days stay for the adherent groups compared to the least adherent group.

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