Prediction of MS disability status in Japanese claims database using principal component analysis

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Background
Claims databases are widely used in MS research to evaluate clinical practice and outcomes of MS treatments in real-world settings. However, disability status as indicated by Expanded Disability Status Scale (EDSS) is not available in claim databases, which makes it difficult to evaluate current healthcare situation of MS patients with higher disability status like SPMS.

Objectives
To describe healthcare situation in Japanese MS patients with higher disability status like SPMS, using a score representing disability status developed by principal component analysis from claims database.

Methods
We employed principal component analysis, which is a multivariate data analysis technique, for developing a score to predict the severity of EDSS using the information extracted from claims data. The Medical Data Institute database is nationwide hospital-based claims database covering all diseases, was used as a data source (2009-2018, n=787). Diagnosis and medication codes related to 7 functional systems of EDSS were selected based on the MS treatment guideline and advice of the medical expert. Additional claims (e.g. locomotorium rehabilitation) which are supposed to be associated with higher disability status were also included. A score for each patient in each year was calculated based on the eigenvalue coefficient for each factor of the first principal component, and then divided into 4 groups by quartile values of this score. Treatment pattern, healthcare resource utilization and costs in these 4 groups were described.

Results
The average ages were 43.3 and 55.4 years in the lowest and highest score groups, respectively. The disability score first diagnosis usually was for the lowest group and 5 years for the highest group. The total healthcare costs (¥1 523,616 vs ¥1 379,387/year), frequency of visit (419 vs 3,288/year), and hospitalization (456 vs 648/year) were numerically higher in the highest score group compared with the lowest score group. Meanwhile, frequency of relapse was numerically higher in the highest-score group (1.1 vs 4.1% per month), which was counterintuitive considering natural course of MS.

Conclusions
A novel method using claims database was developed to represent MS disability status of an individual patient. This method enabled to describe the current healthcare situation of Japanese MS patients with higher disability status and demonstrated increased healthcare cost and resource utilization in this population.