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Predicting disease course in Multiple Sclerosis using deep learning on clinical data

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Introduction:

Multiple sclerosis (MS) is a demyelinating disease affecting both the brain and spinal cord, causing inflammation and disruption in the signal transmission of the nervous system. MS usually starts as relapsing-remitting MS (RRMS) with relapses and demyelination, later transitioning to secondary progressive MS (SPMS), with continuous neurodegeneration and progression of disability. The transition to SPMS is usually diagnosed in retrospect, as there is currently no way to identify individuals at risk for SPMS.

Objectives/Aims:

To identify patients with SPMS using a deep learning approach.

Methods:

We developed a deep-learning model capable of predicting the current disease status. Clinical data were extracted from the Swedish MS registry (SMSReg), containing clinical data for 22,748 MS patients and 197,227 patient visits. The model was then trained on longitudinal information containing information on current and previous clinical visits, containing clinical features such as Expanded Disability Status Scale (EDSS) score, sex, age of onset, relapses, Magnetic resonance imaging (MRI) data, and drug treatments.

Results:

The model identified patients with SPMS earlier than the assessing clinical neurologist in 54.7% of cases, matched the clinical assessment of the neurologist in 33.8% of cases, and identified SPMS later than the clinical neurologist in 5.8% of cases. The model was also able to correctly assign disease courses to patients with only RRMS and SPMS from the beginning of diagnosis, with 83.7% and 92.6% accuracy, respectively.

Conclusion:

A deep learning model outperformed the assessment of clinical neurologists in 91.5% of cases and could be used to support the diagnosis of SPMS. Artificial intelligence is a promising tool in neuro healthcare and should be explored further.

Disclosures:

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