Machine learning methods for motor recovery prediction and prognosis in post-stroke rehabilitation: a systematic review.

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Abstract

Background. The rehabilitation field has always been characterised by the difficulty of conducing rigorous clinical trials and the need of an individualised care for the patient. The recent framework of Rehabilomics addresses the gap between research and clinical treatment needs. It promotes a systematic collection of data from the patient and it uses it in order to generate a treatment protocol for personalised therapy. Machine learning techniques can be considered a primary tool for embracing this new framework. The objective of this work is to develop a systematic review on machine learning algorithms trained and validated as predictive models for the clinical outcome of post-stroke patients after rehabilitation treatment.

Methods. We conducted a systematic review and included machine learning methods as predictive performance of motor recovery in all types of stroke. We conducted a comprehensive search of electronic databases such as PubMed, Web of Science, Scopus, CINHAL and Central using a Patient, Intervention, Comparison, Outcome format (PICO format), from inception to the 7th of February 2020. Data extracted included: health condition, intervention in the experimental and control group, dose, frequency and number of sessions, outcome assessed and how it has been measured, method for features extraction and selection, algorithm used for the model and validation approach. Methodological quality of included reviews has been assessed using the Prediction model risk of bias assessment tool (PROBAST), which assesses risk of bias over four domains, as well as applicability. A narrative description of the characteristics of the primary studies has been provided and a narrative data synthesis reporting the performance of individual prognostic models has been also performed. The opportunity of performing a meta-analysis has been evaluated on the level of heterogeneity of primary studies included.

Results. 846 studies met the inclusion criteria and were included in systematic review. All participants were adults with stroke. The data analysis is still ongoing and the final results will be presented during the Cochrane Colloquium.

Conclusions. Our results will highlight the better performing models and next steps for their comparison, extension or implementation.

Patient or healthcare consumer involvement. Not applicable.